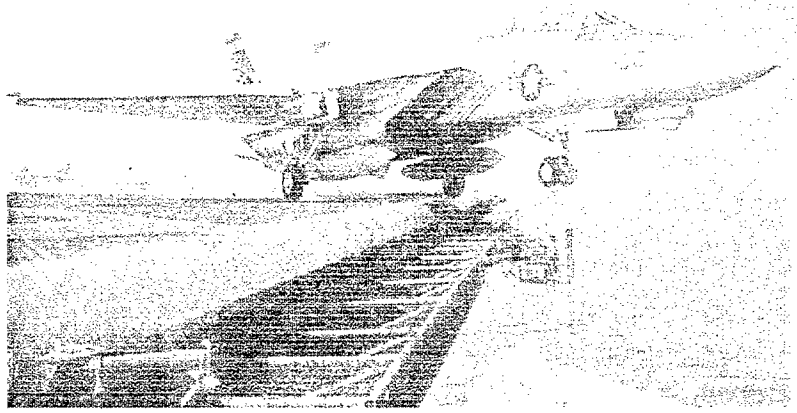
Petroleum Quality Information System Jet Fuels Data



1997

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December 30, 1998

PETROLEUM QUALITY INFORMATION SYSTEMS JET FUELS DATA (1997)

This is the second report, summarizing test results of aviation fuels received in calendar year 1997 with comparison statistics from calendar year 1995 and 1996. Data is stored in our Petroleum Quality Information System (PQIS) Database which currently contains 4,385 records, representing just under 6.8 billion gallons of product, starting from January 1, 1995.

Many DESC personnel contributed to its development, maintenance and data entry functions. Special thanks go to the field offices of DCMD and DCMDI for their response in providing information for shipments that were missing from the database. The result of this effort was an increase by almost ½ billion gallons of jet fuel represented in the report. The JP4 representation increased to 100% for both 1996 and 1997. For 1996, JP5 representation increased from 24% in the 1990-1996 Report to 87% in this Report. JP8 representation also increased from 57% to 81% for calendar year 1996.

The first report was published in June, 1998 and covered data for years 1990 – 1996. Data was summarized to provide statistical information on average, minimum and maximum values of selected test properties for use by our customers in researching specification or quality issues.

Comments and questions pertaining to this report and recommendations for future reports are welcome. Please contact Mr Kenneth Henz at Commercial (703) 767-8356 or DSN 427-8356.

W. A. ROBINSON
Director
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Table of Contents

List of Charts

Table of Contents (Continued)

Section 1 – Executive Summary

The Office of the Assistant Secretary of Defense, Energy Policy Directorate, in 1989, authorized the establishment of Petroleum Quality Information System (PQIS), which would standardize data entry, be used to track trends in product quality and to address quality issues. The initial implementation of PQIS began with aviation fuels (JP4, JP5 and JP8) procured for the military and data entry began in 1990. Data continues to be collected through the present. More representative data for 1995 through the present is stored in the active PQIS database and information from 1990 – 1994 is archived in a separate table.

The first PQIS Report was published in June 1998 for the data covering calendar years 1990 through 1996. For selected test parameters, Histograms showed the distribution of data by volume for the specified years and Tables in the Appendix provided a tabulation of regional data over all citing the statistical summary of minimum, average, volumetrically weighted average and maximum values. The Petroleum Administration for Defense Districts (PADDs) was used as a basis for dividing the world into regions (See *Chart 3*).

This 1997 Report follows the format of the first report in showing Histograms and Tables for the selected properties. Histograms show the spread of data only for 1997. The Tables cover the years 1995 – 1997, statistically summarized as in the first Report by Region. An extensive effort was made to identify missing information and to obtain the missing information in order to provide a more complete representation of fuel purchased through the DESC bulk fuels program. With the assistance of the Defense Contract Management District (DCMD) field offices, the volume of JP8 represented in the PQIS database increased in 1996 from 57% in the 1990-1996 Report to 81% for this 1997 Report. Representation of JP4 and JP5 also increased, and *Chart 2* provides these percentages.

Military specifications are used to procure the aviation fuels for the US Government. Therefore, the trends noted in this report might not necessarily reflect those seen in industry, since the military fuel is in some cases specially blended to meet the military specifications.

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Section II - Introduction and General Information

Background

In 1987, the Logistics Management Institute (LMI) published a report entitled: *"Petroleum Quality Information System (PQIS): Architecture and Design Alternatives"* which outlined system requirements and alternatives for a system that would store and process information on the quality of petroleum products procured and used by the Department of Defense (DoD). In February 1988, the Office of the Assistant Secretary of Defense, Energy Policy Directorate, made a request for review and comment on this LMI report to the Services. Responses were collected from March - May 1988, which clearly established the need for a system to track quality trends and to have a standardized method of entering in data electronically. As a result of the survey, the Defense Energy Program Policy Memorandum (DEPPM) 89-1, dated 25 April 1989 was issued which established the requirement for PQIS and designated the Defense Fuel Supply Center (now DESC) as responsible for designing the PQIS. PQIS was planned as an automated mainframe information management system that would standardize dissimilar government and private sector quality control and surveillance data reporting formats into a standardized format. The information in the database would be available to DoD personnel for use in identifying, investigating, and resolving fuel related equipment problems.

The DEPPM 89-1 authorized LMI to develop a prototype to be tested and evaluated by DESC. The review was completed in March 1989. Because of funding constraints and the complexity of designing an all-encompassing system, the initial PQIS database system was built around procurement of aviation fuels (JP4, JP5 and JP8). This prototype PQIS system was put into operation in October 1990. The initial system was PC-Based (in DBase IV), not on a mainframe. The first report entered into the database was dated 25 Sep 90. Since that time, the database program was converted to Access 2.0, then Access 7.0 and now Access 97. Test reports received from contractors worldwide were entered into the database. There are plans in the near future to expand the system to include other fuels and quality surveillance data.

The first survey report was published in June 1998 which provided statistical information on data from calendar year 1990 to calendar year 1996. This report is a follow-on to the first survey report, using the same formats for Histograms and Tables to facilitate comparison with the previous reports.

Upon completion of the initial report, all test results for calendar years 1990 – 1994 were archived and test results starting from 1 January 1995 were kept in the active database. Because of the low percentage of product volume in PQIS versus product purchased reflected in *Chart 2* of the 1990–1996 PQIS Report, a special effort was made to increase the representation of the volume purchased. Volumes in PQIS were analyzed against a listing of known orders filled and discrepancies were sent to the Defense Contract Management District (DCMD) field offices to gather the missing data. DESC contract numbers contain the fiscal year date as part of the contract number. For example, the contract number "SPO600-96-D-5015" contains the digits "96", which indicates that the contract was awarded in fiscal year 1996. Using the contract number as the basis for the fiscal year grouping, volumes represented in PQIS can directly be compared against the volume delivered from each order on each contract as reported to DFAMS.

The response of DCMD was overwhelming, accounting for an increase in volume representation of just under 0.5 billion additional gallons of aviation fuel for the time period 1995-1997 available for this 1997 Report. All of these additional test reports are included in this report.

The contract delivery period may cross the calendar year ending date. At the start of fiscal year 1997, deliveries were made in 1997 for contracts let in 1996. Therefore, to assess contractor compliance in *Chart 2*, the data was grouped by fiscal year of the contract. However, the histograms and tables in the Appendix are based on calendar year grouping of data, because it is easier in Access to do this grouping rather than a fiscal year grouping. For the fiscal year 1995 percentage data, all deliveries made from fiscal year 1994 contracts and prior contracts which were delivered in 1995 are included in the fiscal year 1995. Similarly, one fiscal year 1998 contract had a delivery towards the end of 1997 and is included in the calendar year data for 1997.

Summary Information

Using the test report date as the basis for the calendar year grouping, the data in the PQIS database for 1997 represents **46 individual contracts**, having **1658 data points** for a total of **2.65 billion gallons** of AN8, JP4, JP5 and JP8. *Chart 1* below shows number of shipping tank reports and the volume represented (in millions of gallons) for each year covered by this report.

Chart 1

Total Jet Fuel Entries by Calendar Year

(Volume in Millions of Gallons)

	1995		1996		1997		Total	
Fuel	Volume	Number	Volume	Number	Volume	Number	Volume	Number
AN8			9.11	6	3.20	3	12.31	9
JP4	67.10	139	0.89	6	1.64	9	69.63	154
JP5	87.22	41	503.25	163	701.73	246	1292.20	450
JP8	992.81	738	1823.42	1229	1942.87	1400	4759.10	3367

The above data in *Chart 1* indicates number of test reports for each individual shipping tank used to sell product to DESC, not the number of shipments made. A single product movement may involve more than one shipping tank, just as many product movements (e.g., truck shipments) could have the same source tank. The quantity shipped from each tank is meant to indicate actual quantity shipped to the US Government under DESC contract at a refinery or terminal from a particular shipping tank, not the total quantity in the Tank at the time of sampling. Thus, this database represents what was actually delivered to DESC customers. The quantity reported on the test report from each shipping tank forms the basis for calculating the volumetrically weighted average (See "Use of Terms", page 8, for the definition of volumetrically weighted average) for a specification property.

Included in *Chart 1* for this year's report is data for a special aviation fuel procured for use in the Antarctic with the product code of "AN8". Since this product is purchased only once during the year and the amount procured is small compared with the other aviation fuels, it is omitted from the Histograms in **Section III** and Charts in the **Appendix**. However, *Chart 8* displays minimum, average, volumetrically weighted average and maximum values for selected test properties for AN8 for years 1996 and 1997 (a total of 9 reports representing 12.31 million gallons). Similarly, since 9 reports were received in 1997 for JP4, the statistical summary for selected specification properties is presented in *Chart 7*. Data for JP4 is also omitted from the Histograms and Charts.

Chart 2 shows the representation of the volume of product reported for inclusion in PQIS versus the amount actually purchased. Each contract number contains a segment which indicates the fiscal year in which the contract was awarded. With contracts grouped according to the fiscal year in which they were awarded, the DFAMS printout for each contract line item was compared, order by order, to the quantity represented in PQIS. Since an order can be made in December and delivered in January, grouping delivery periods can extend across calendar year lines, the fiscal year was chosen as the basis for the comparison in lieu of calendar year. Volumes in *Chart 2* represent information on complete specification results on the aviation fuels JP4, JP5, and JP8 on a *world-wide* basis focusing on what was shipped to DESC customers.

Chart 2

Chart By Fiscal Year of Volumes Reported and Percentage of Total Volume Purchased (Millions of gallons)			
JP 4	**1995**	**1996**	**1997**
Reported	66.9	1.6	0.6
Purchased	117.2	1.6	0.6
Percentage	***57%***	***100%***	***100%***
JP 5	**1995**	**1996**	**1997**
Reported	186.4	670.3	389.6
Purchased	986.5	771.0	401.5
Percentage	***19%***	***87%***	***97%***
JP 8	**1995**	**1996**	**1997**
Reported	686.9	1893.6	1052.8
Purchased	3137.3	2340.5	1498.4
Percentage	***22%***	***81%***	***70%***

In general, the differences between the reported volumes and the purchased volumes of JP8 for 1996 (446.9 million gallons) and 1997 (445.6 million gallons) are attributed to contractors not submitting any test reports for their contracts. Though a similar amount of fuel is missing for 1996 and 1997, the 1997 percentage is lower because the total volume purchased was lower.

Chart 3

Regional Assignments for PQIS Report

Region	PAD District	Title	States or Countries
1	I	East Coast	ME, VT, NH, MA, RI, CT, NY, PA, NJ, DE, MD, VA, WV, NC, SD, GA, FL
2	II	East Central	ND, SD, MN, IA, NE, WI, MI, OH, KY, TN, IN, IL, MO, KS, OK
3	III	Gulf Coast	AL, MS, AR, LA, TX, NM
4	IV	West Central	MT, ID, WY, UT, CO
5	V	West Coast	WA, OR, CA, NV, AZ
6		Middle East	Kuwait, Bahrain
7		European	Europe, Israel and Turkey
8		Pacific	Korea, HI, AK, Australia

The ability to group this world-wide data into geographical areas (e.g., Europe, Western US, etc) may be desirable in order to provide a more specific or focused analysis of data for a particular area of interest. For example, a researcher may want to know how the sulfur results vary for the West Coast of the United States versus the East Coast. To assist in this regional type of analysis of characteristics of fuels purchased by the US Government, "regions" were assigned to each state in the United States and geographically in overseas areas. These "regions" are defined in *Chart 3*, which divides the continental United States along the same lines as the PADDs (Petroleum Administration for Defense Districts).

Since the end of World War II, the Petroleum Administration Districts (PADDs) were used by the Department of Energy to divide the United States into regions for use in statistical analyses (mainly price factors) as a common baseline for calculating and reporting. The use of the PADDs in this report provides the advantage of using an existing common industry reference for comparative statistical purposes.

Use of Terms

To avoid confusion or misunderstanding in discussions, terms used within this report are used as follows:

a) **Spectender** - A complete specification analysis report of product being offered for acceptance by the US Government. For fuels, it is the written report of results for full specification testing in the refinery or terminal shipping tank for product offered for acceptance.

b) **Report** - Represents one spectender tank test result (Complete Specification Test Results), regardless of how many shipments were made out of the tank or if more than one tank was involved in a total loading or product movement.

c) **Volume** - Total volume, expressed in millions of gallons, delivered to the US Government or other designee from the shipping tank referenced in the report.

d) **Region** - As defined in *Chart 4*, refers to the grouping of states and countries based in the continental United States on the PADDs. These regions do not correlate with the Defense Fuel Regions or Offices. Since shipments can originate and terminate in different regions, the determination of the region was chosen based on the refinery location rather than the receipt location.

e) **Average/Volumetrically Weighted Average** - The average calculation based on volume of fuel purchased rather than each instance of purchase. For example, if one batch of product had an API Gravity of 46.0 with 1,000,000 gallons delivered and another batch had an API Gravity of 43.5 with 500,000 delivered, the **average**, based on occurrences of test values, would be:

$$(46.0 + 43.5)/2 = 44.75.$$

The **volumetrically weighted average,** based on volumes of product represented by the test values, would be:

$$(46.1 \times 1{,}000{,}000) + (43.5 \times 500{,}000) / 1{,}500{,}000 = (67{,}750{,}000 / 1{,}500{,}000) = 45.17$$

The difference between the two averaging methods is 0.42°API. Each method uses a different basis to calculate the average. Both averages are provided in this report.

Summary of Data by Region

The next three charts provide a breakdown of the total number of reports received per Region and a further breakdown of volume and number of reports received for each product grade. *Chart 4* below indicates the total number of aviation fuel test reports received by year from each region as an aid in evaluating data presented in this report. Clause E40.05, *Material Inspection and Receiving Report*, cited in DESC contracts, requires our contractors to send in a copy of the complete laboratory test reports from each shipping tank used for shipments.

Chart 4

Total Reports Received by Year and Region

	Region								
Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**
1995	30	83	349	150	154		30	122	918
1996	60	148	544	96	242	10	133	171	1404
1997	41	293	566	86	357	10	108	197	1658

The values above represent the number of possible data points available for each region for all of the JP4, JP5 and JP8 received for that year and were entered into the PQIS database. Again, the number of occurrences do not directly relate to the number of shipments made during that year since one batch from the refinery tank may have been used for multiple shipments on different orders. Information in *Chart 4* is provided as an indication of the responses received from the different regions. The greatest number of reports were received from Regions 2 through 5. Region 3, which includes Texas, still leads in the submissions of reports.

Chart 5 below represents the volume of aviation fuels, in millions of gallons, refined each **calendar** year from the various Regions and sold to Department of Defense customers. As more locations converted from JP4 to JP8, the total volume of JP4 delivered decreased as the total volume of JP8 delivered increased. Although outside the scope of this report, it is possible to further break down the volumes received by the state in which the refinery is located, by company name, by refinery location or by contract.

Chart 5

Yearly Breakdown by Fuel of Volume Received

(Millions of Gallons)

		Region								
Year	**Fuel**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**
1995	JP4				61.87			4.89	0.34	67.1
	JP5			55.48				31.74		87.22
	JP8	2.88	126.64	451.51	9.97	239.30		65.12	97.39	992.81
1996	JP4								0.89	0.89
	JP5			308.86		51.36	22.72	80.67	39.65	503.26
	JP8	18.81	191.35	633.67	84.94	427.06	37.28	254.27	176.03	1823.41
1997	JP4								1.64	1.64
	JP5			222.26		209.44	59.19	55.84	55.01	701.74
	JP8	5.90	204.62	709.73	53.28	419.15		248.69	301.5	1942.87

Chart 6 provides information on the number of reports received per calendar year for each region. This chart represents a more detailed breakdown of *Chart 4*. *Chart 5* can be used in conjunction with *Chart 6* to get an idea of the average parcel size, which can be indicative of which modes of transportation are used. For example, for Region 6 for JP8 in 1996, 7 tenders were reported representing 37.28 million gallons, which means that each tender represented over 5.3 million gallons, or the parcel size of a tanker. Reported for Region 4 in 1997 were 86 tenders representing 53.28 million gallons of JP8, or an average parcel size of 0.619 million gallons or 619,000 USG. This could represent mainly truck shipments mixed in with some pipeline shipments of JP8 during this time frame for Region 4.

Chart 6

Yearly Breakdown by Fuel of Reports Received

		Region								
Year	**Fuel**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**
1995	JP4				134			1	4	139
	JP5			33				8		41
	JP8	30	83	316	16	154		21	118	738
1996	JP4								6	6
	JP5			111		17	3	24	8	163
	JP8	60	148	433	96	225	7	108	152	1229
1997	JP4								9	9
	JP5			129		73	10	19	15	246
	JP8	41	293	437	86	284		89	170	170

Product Specifications

For the purposes of this report, only those specification properties which have measurable and definitive requirements in the specification are summarized, with the exception of cetane index (report only) and naphthalene content (not required for JP5). Also, those specification properties which involve an assigned rating (e.g., water reaction, and copper corrosion) are not summarized. However, data is available for the specification properties not reported by request from the Point-of-Contact (POC) provided in **Section I**. Histograms in **Section II** represent the volumes represented of each test property result for 1997 for all Regions.

Not all tests were performed on all batches. For *Net Heat of Combustion*, contractors have a choice of two or three different units of measurement, depending on the product, for reporting the net heat or energy content. Contractors also have the option of performing the *Doctor Test* in lieu of *Mercaptan Sulfur*: If the *Doctor Test* is negative, the *Mercaptan Sulfur* need not be performed. Some contractors elected to report both the *Doctor Test* and *Mercaptan Sulfur*. If the *Smoke Point* was below 25 mm, the product was still acceptable as long as the *Naphthalenes Content* was below 3.0% and the *Smoke Point* was above the minimum of 19 mm. Therefore, the number of reports represented by the data will be different. Specification limits are provided on all Histograms and Tables.

Chart 7

Table of JP4 Values for 1997

Fuel Property	Min	Avg	WtAvg	Max
Saybolt Color	18	29.09	28.43	30
Total Acid Number	0	0.0054	0.0053	0.017
Aromatics	6.5	12.31	12.75	20.1
Olefins	0	0.556	0.570	2.4
Mercaptan Sulfur	0.0002	0.00060	0.00060	0.0012
Total Sulfur	0	0.019	0.018	0.08
Distillation Initial Boiling Point	45	63.15	61.22	84
10% Recovered	79	96.03	95.83	111.1
20% Recovered	90	107.72	108.46	121.1
50% Recovered	110	135.95	137.67	178.3
90% Recovered	165	205.05	203.48	242
Distillation Final Boiling Point	201	241.13	240.72	269.4
API Gravity	52.6	54.55	54.61	56.7
Freezing Point	-86	-61.50	-62.21	-55
Smoke Point	20	26.08	21.26	35
Hydrogen Content	13.6	14.315	12.28	14.9
Existant Gum	0	0.33	0.44	3
Particulates	0.03	0.356	0.395	0.98
Filtration Time	2	4.63	4.44	10

Chart 8

Table of AN8 Values for 1996 and 1997

Fuel Property	Min	Avg	WtAvg	Max
Saybolt Color	17	23	22.1	27
Total Acid Number	0.001	0.0063	0.0061	.013
Aromatics	13.1	14.39	17.36	16.3
Olefins	0.2	1.03	0.94	2.2
Mercaptan Sulfur	.0001	0.00078	0.00084	0.002
Total Sulfur	0.01	0.03	0.038	0.09
Distillation Initial Boiling Point	143.0	148.36	147.47	152.1
10% Recovered	163.0	165.00	164.74	168.0
20% Recovered	167.0	171.42	171.00	175.0
50% Recovered	177.0	191.03	189.57	198.5
90% Recovered	195.0	232.18	227.89	252.5
Distillation Final Boiling Point	209	255.83	250.19	268.5
API Gravity	41.1	44.00	44.62	49.7
Freezing Point	-62.0	-59.48	-59.2	-58.3
Smoke Point	19.6	22.87	23.09	27.6
Hydrogen Content	13.6	13.80	13.83	14.11
Existant Gum	0.8	1.19	1.42	3
Particulates	0.05	0.356	0.359	0.50
Filtration Time	4	6.7	6.6	10
Viscosity	3.1	3.77	3.70	4.3

Section III - Histogram Charts

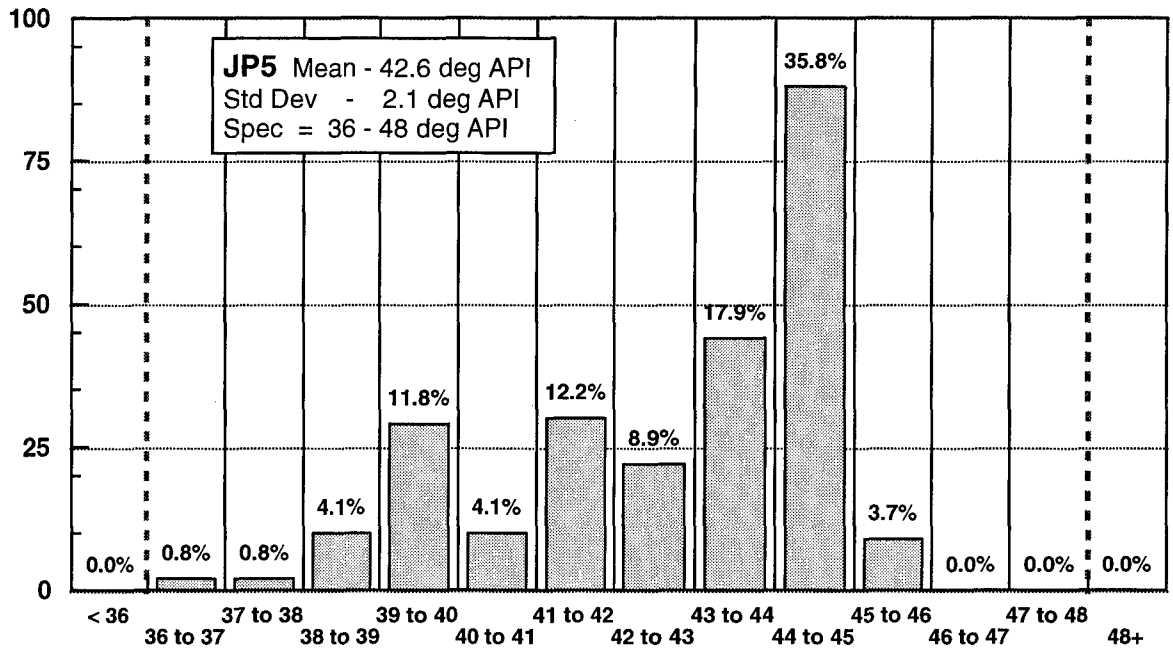
Created in Harvard Chart XL, each histogram shows, for each product and fuel characteristic, the percent by volume of product refined for delivery to the US Government for 1997 for all locations worldwide. The grade of fuel and specification value is indicated in the block within the chart, along with the mean and standard deviation values. Harvard Chart XL automatically calculated the mean and standard deviation for each Histogram. The percentages above the bar represents the percent of total volume of data falling within the data ranges indicated on the x-axis. Heavy dashed lines in the graph represent specification values. To insure all data is included, the first and last bars, where appropriate, have an allowance for data outside of the ranges upon which the histograms are based. A "<[low value]" indicates all occurrences of volumes less than lower range [low value] and a "[high value]+" indicates all occurrences of volumes greater than the upper range [high value].

The data indicates the overall distribution of test results on a worldwide basis for 1997. For some physical and chemical characteristics, more than one method is authorized by the specification. No attempt was made to separate results by the test method used where more than one method was possible, although this also can be done if requested.

Chart 9

Distribution of API Gravity by Volume Received for 1997

(Millions of Gallons)



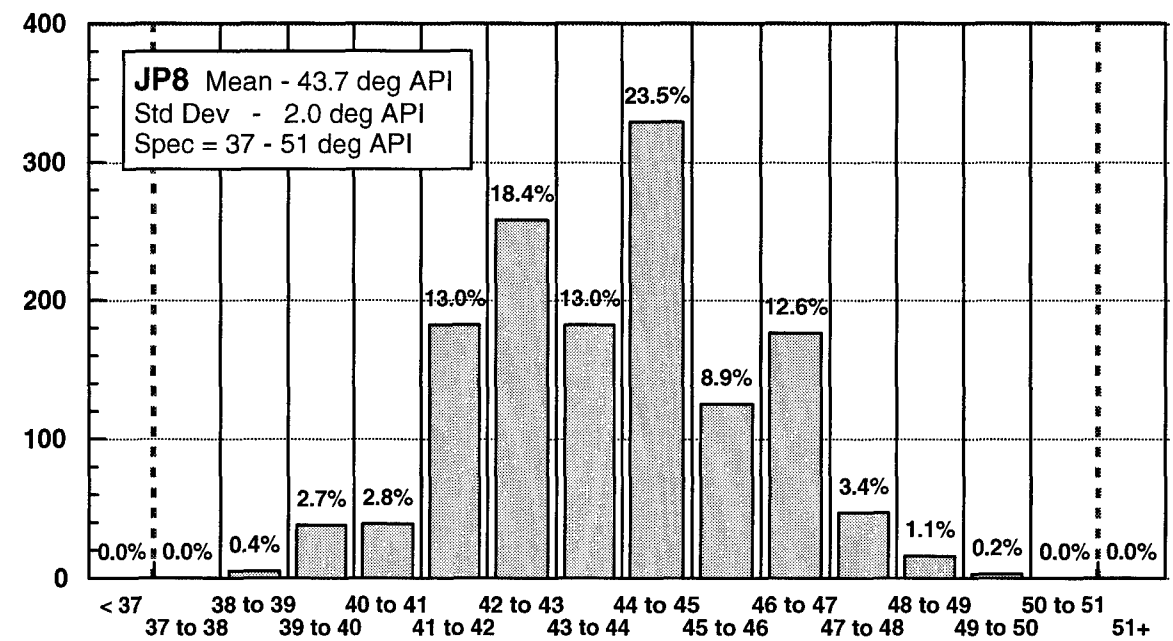
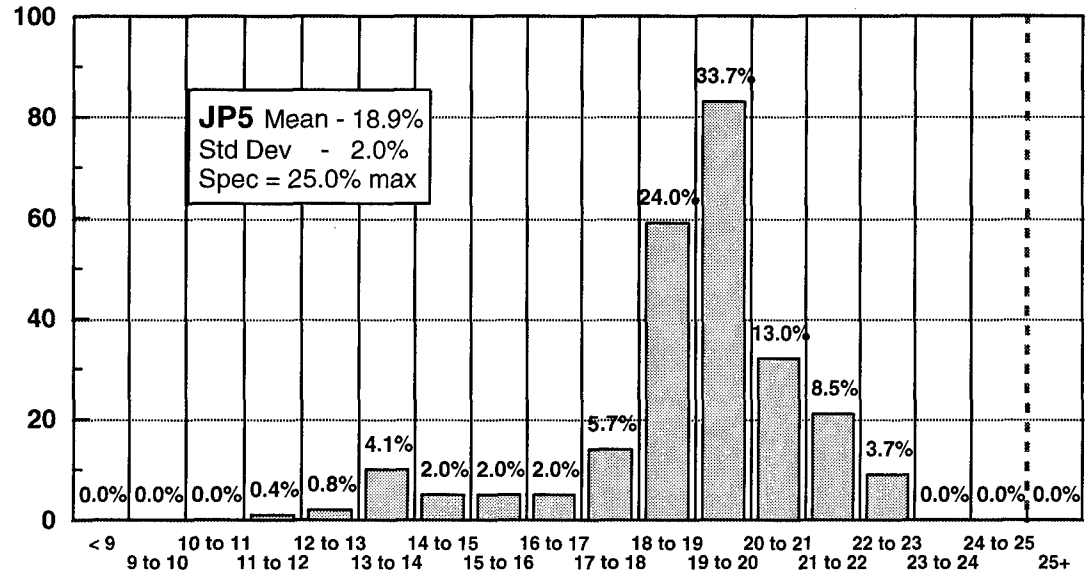


Chart 10

Distribution of Aromatics by Volume Received for 1997

(Millions of Gallons)



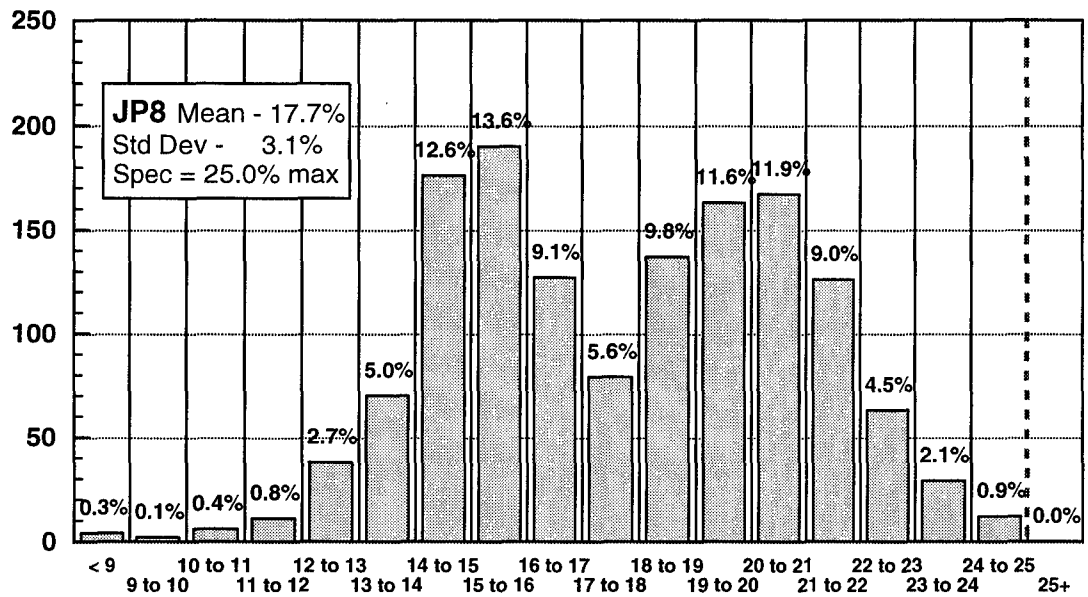
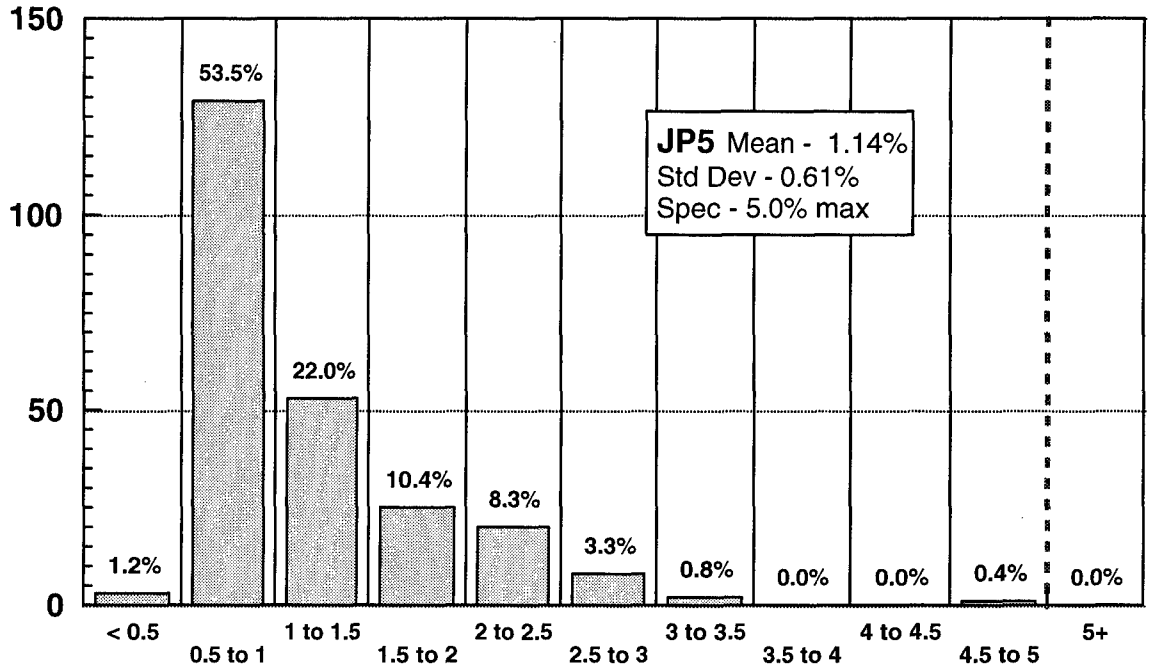


Chart 11

Distribution of Olefins by Volume Received for 1997

(Millions of Gallons)



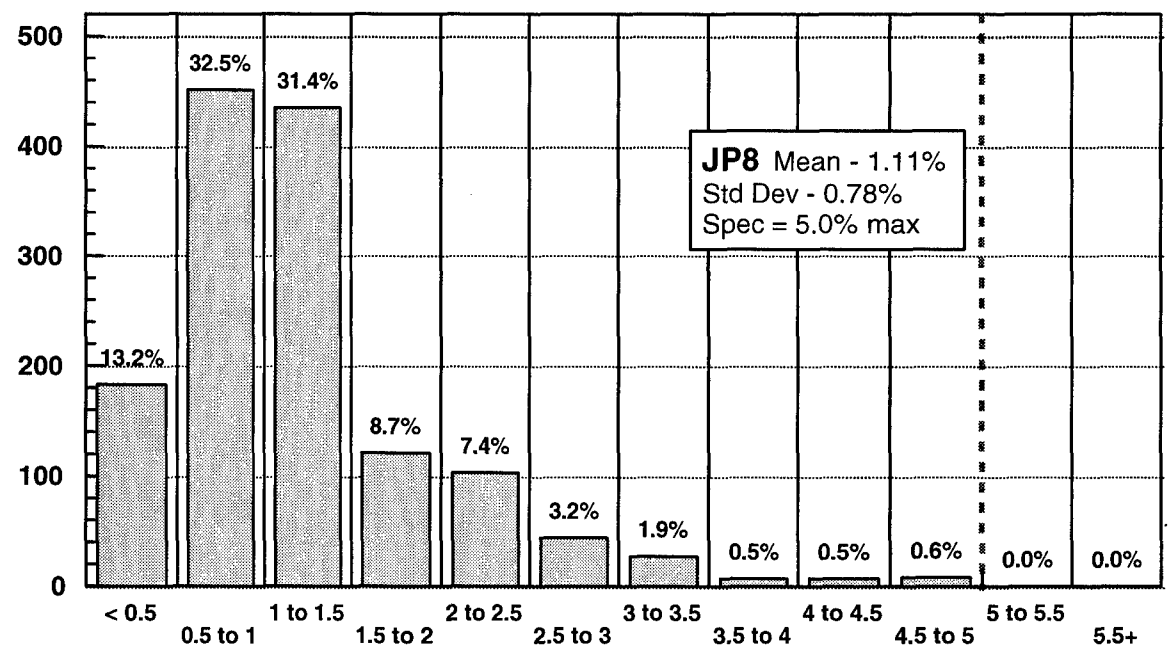
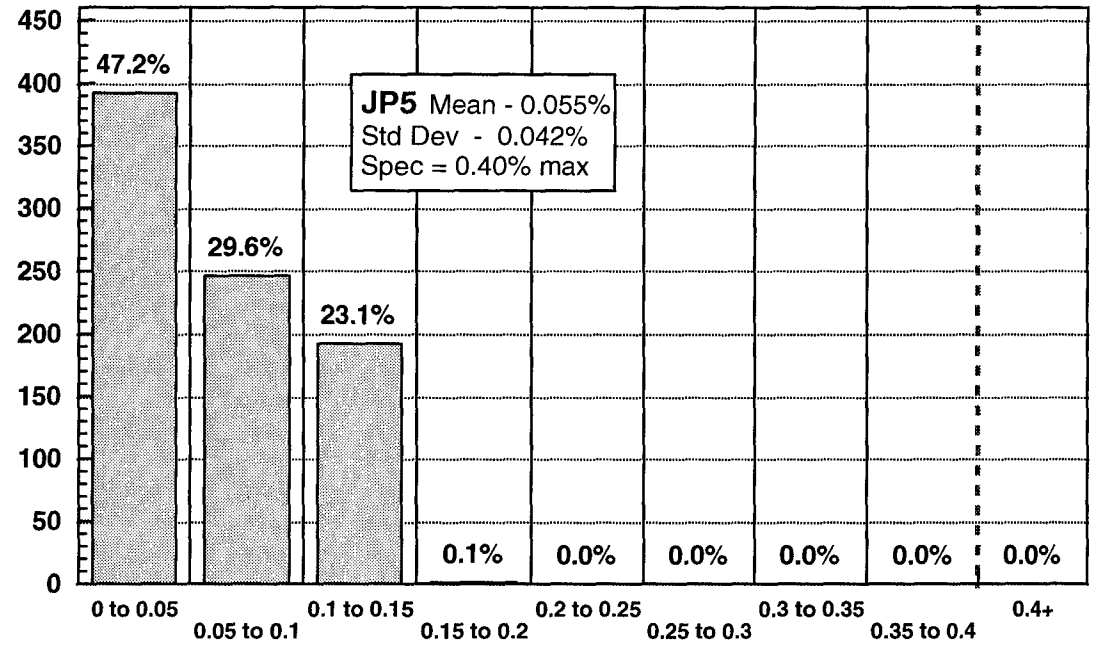


Chart 12

Distribution of Total Sulfur by Volume Received for 1997

(Millions of Gallons)



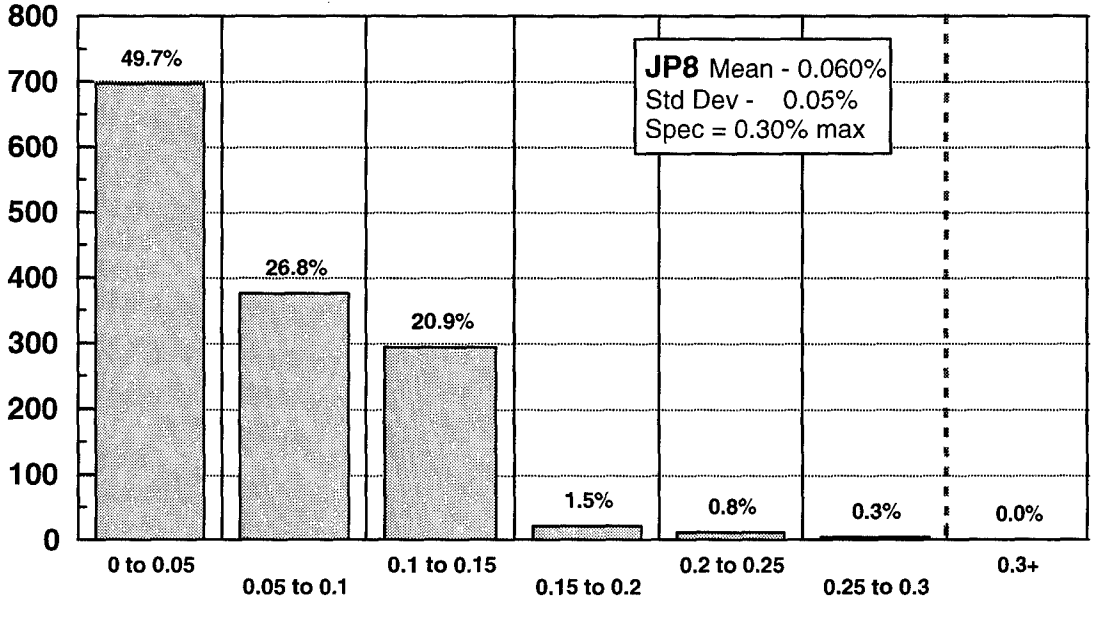
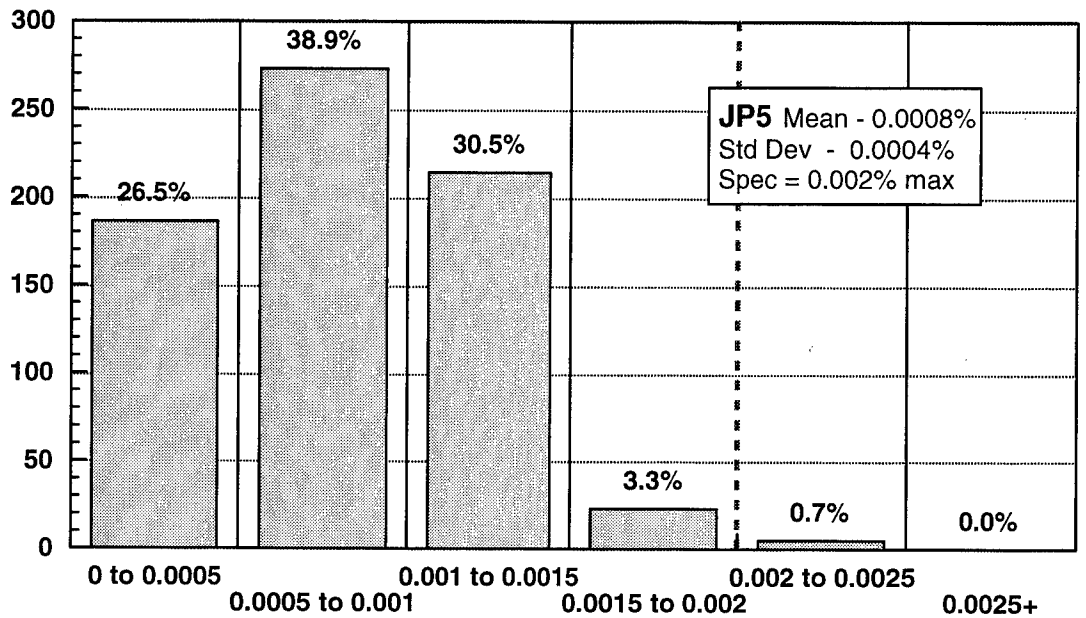


Chart 13

Distribution of Mercaptan Sulfur by Volume Received for 1997

(Millions of Gallons)



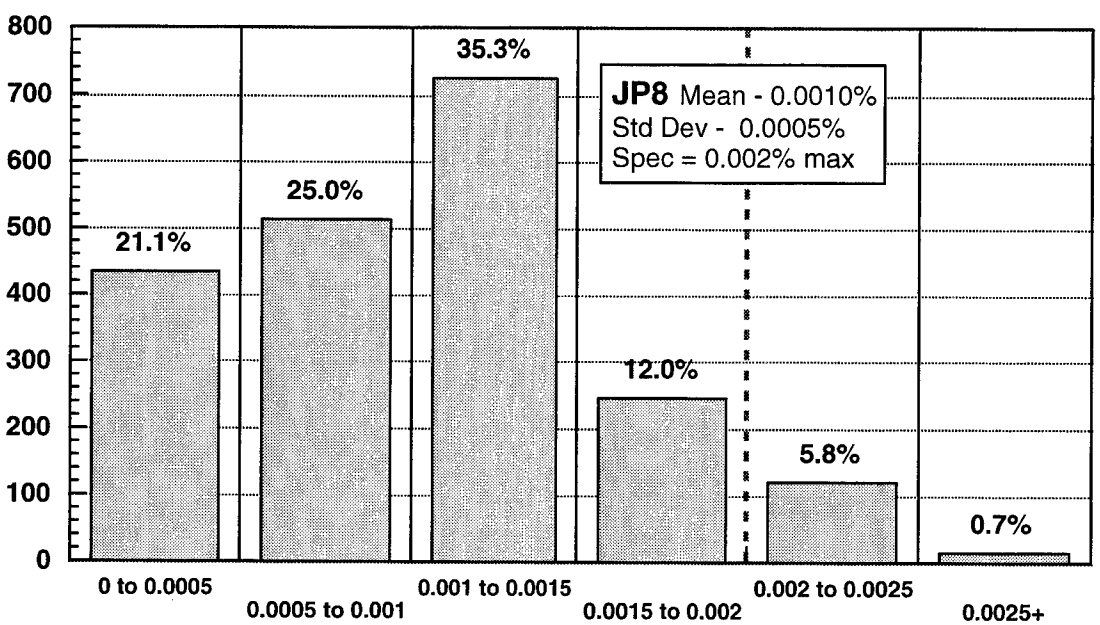
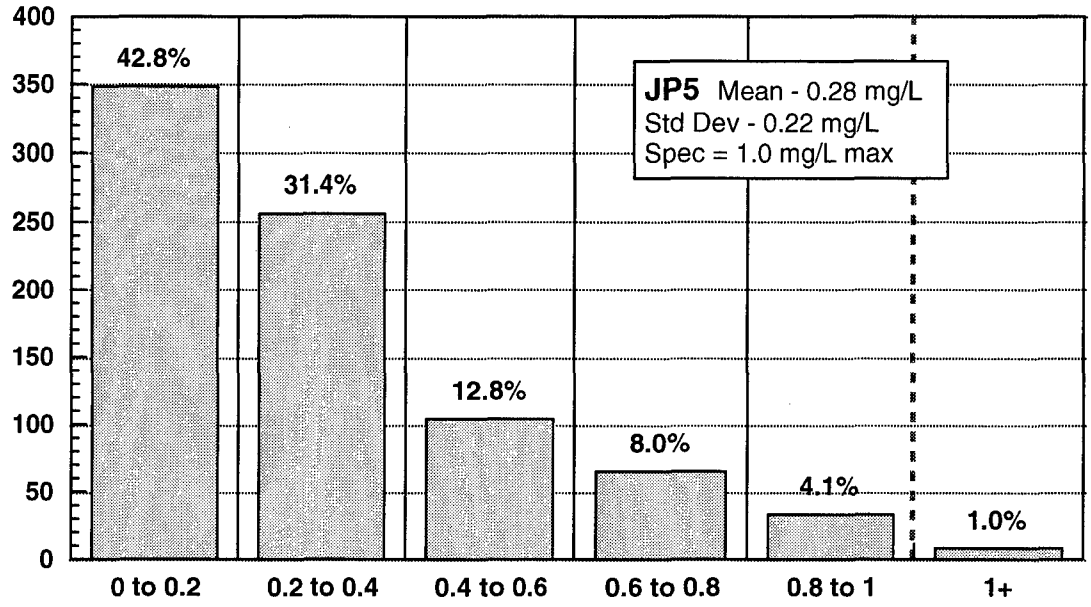


Chart 14

Distribution of Particulate Contamination by Volume Received for 1997

(Millions of Gallons)



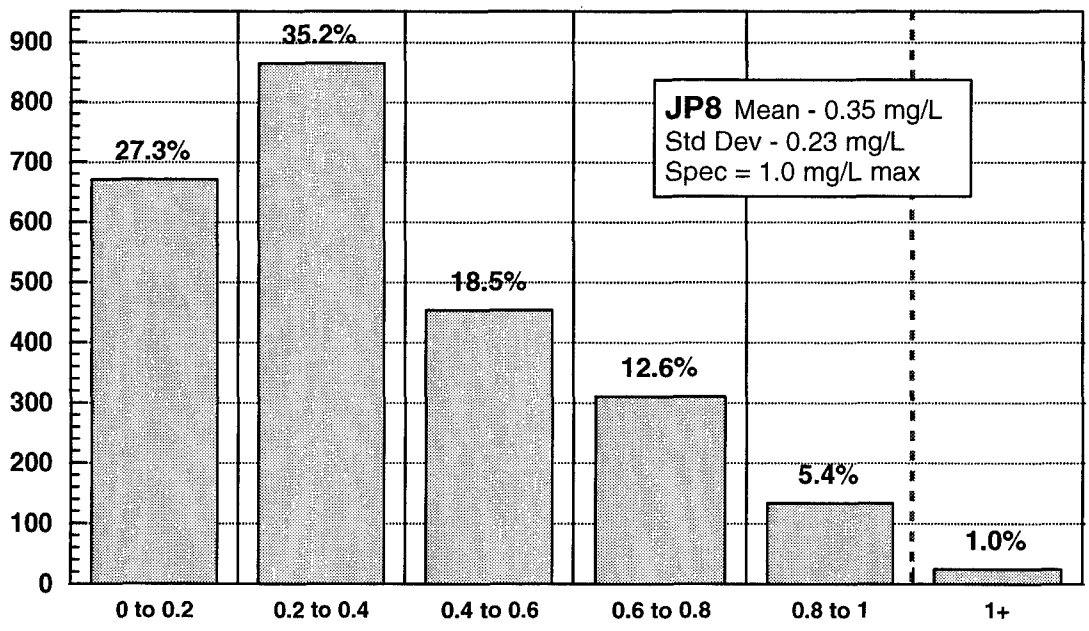
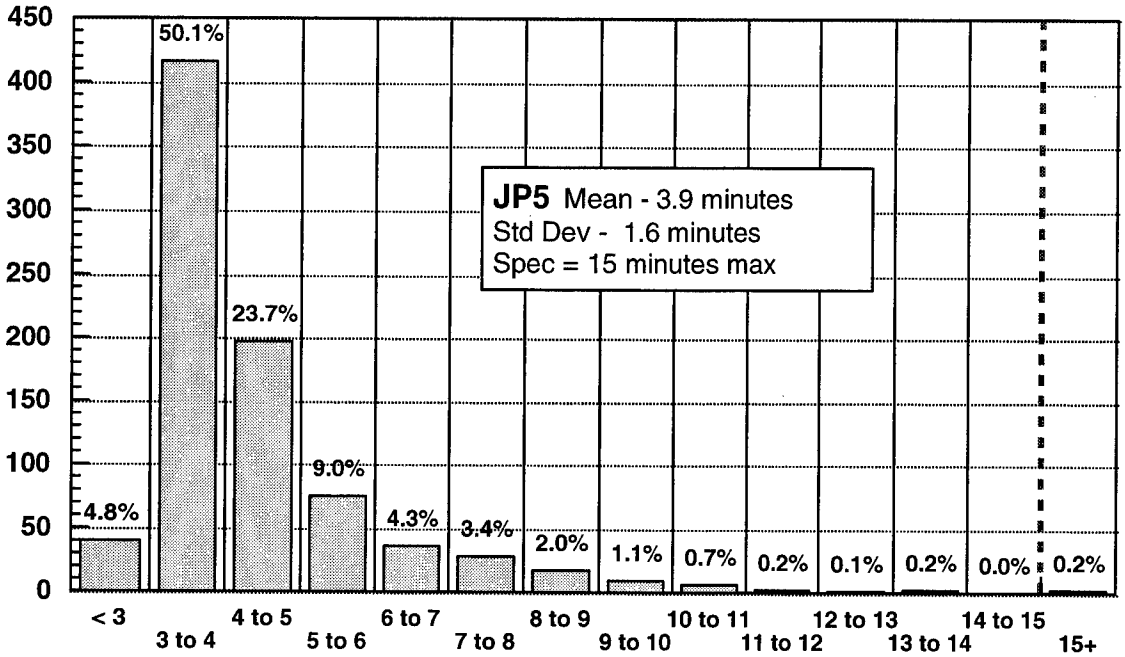


Chart 15

Distribution of Filtration Time by Volume Received for 1997

(Millions of Gallons)



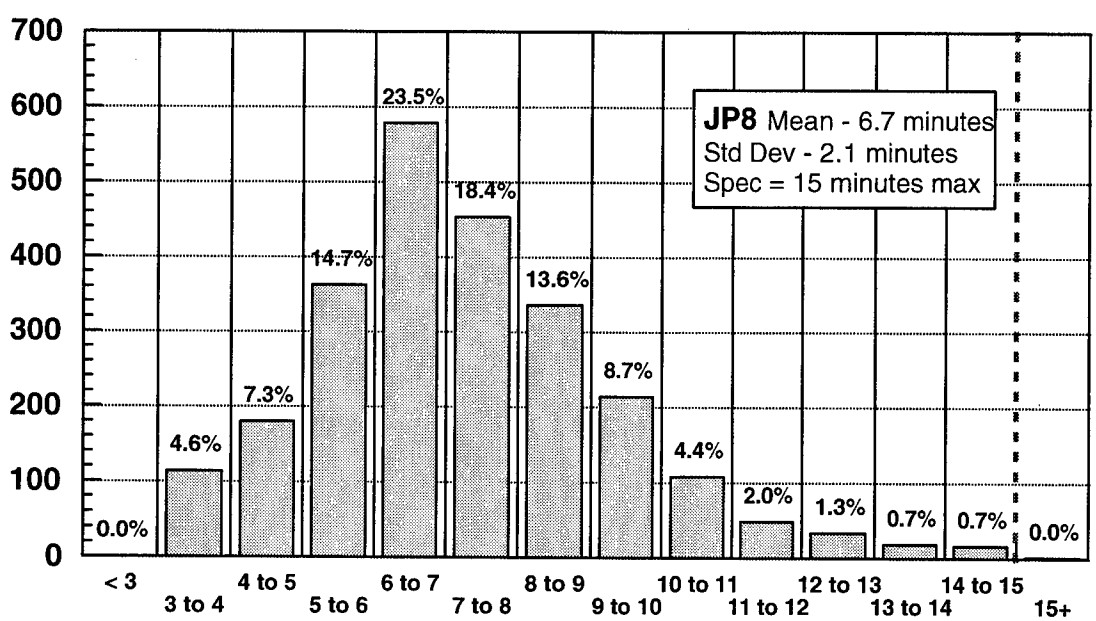
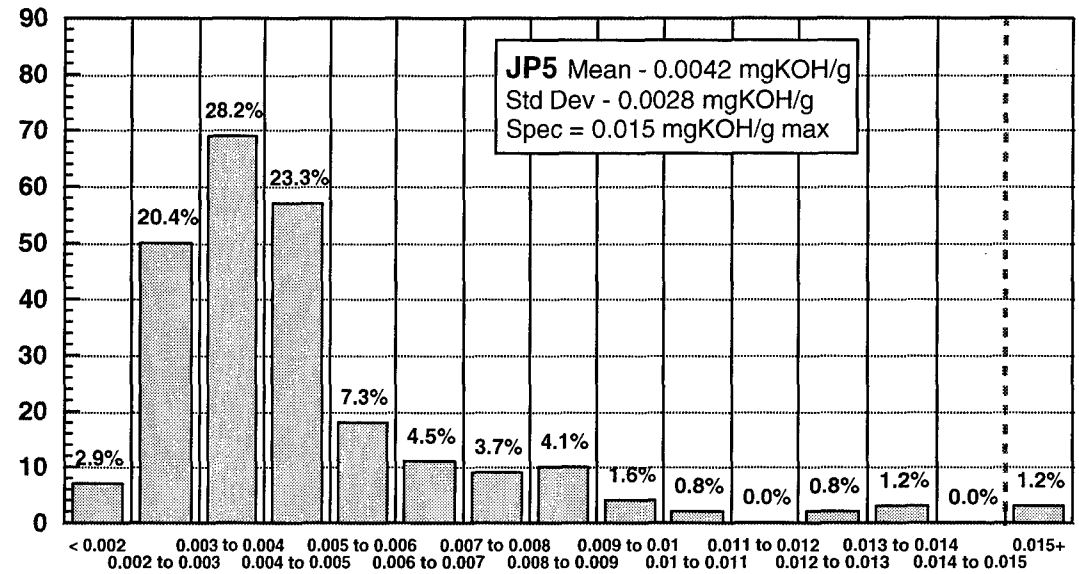


Chart 16

Distribution of Total Acid Number by Volume Received for 1997

(Millions of Gallons)



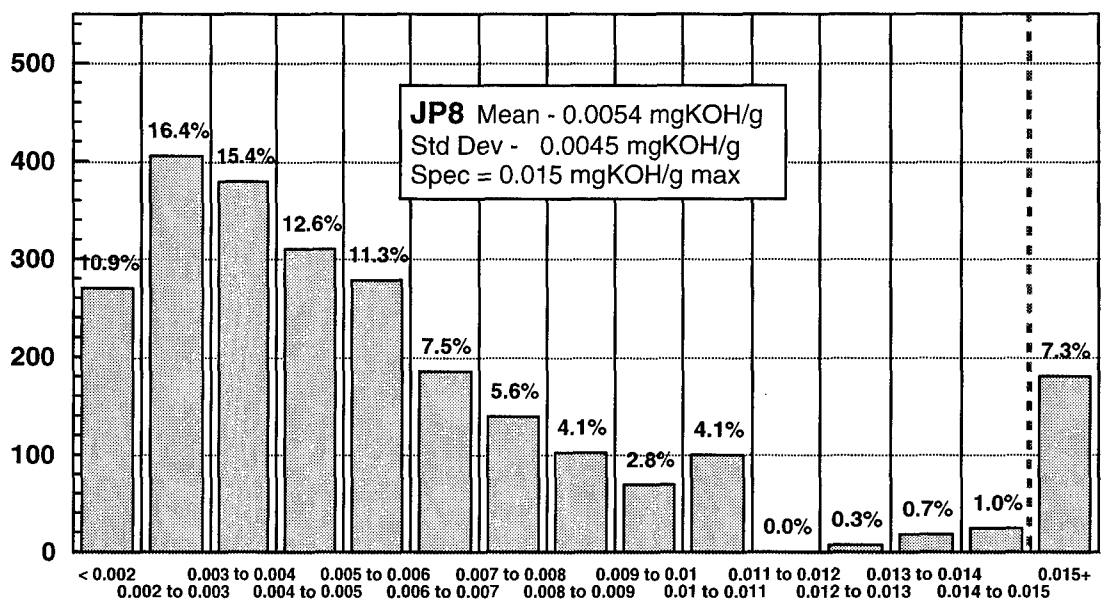
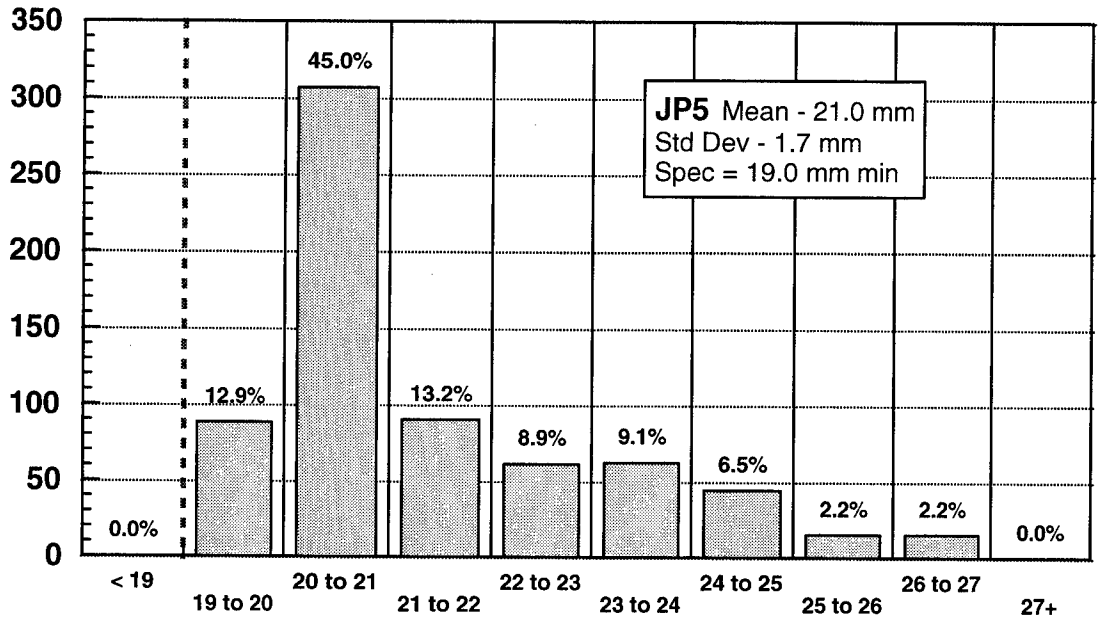


Chart 17

Distribution of Smoke Point by Volume Received for 1997

(Millions of Gallons)



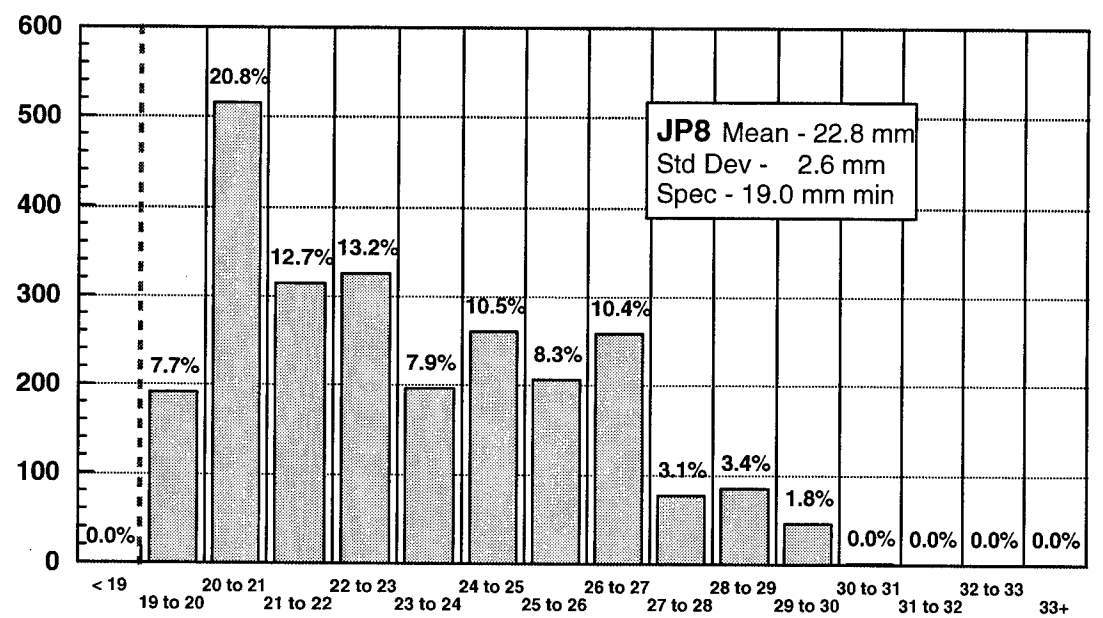
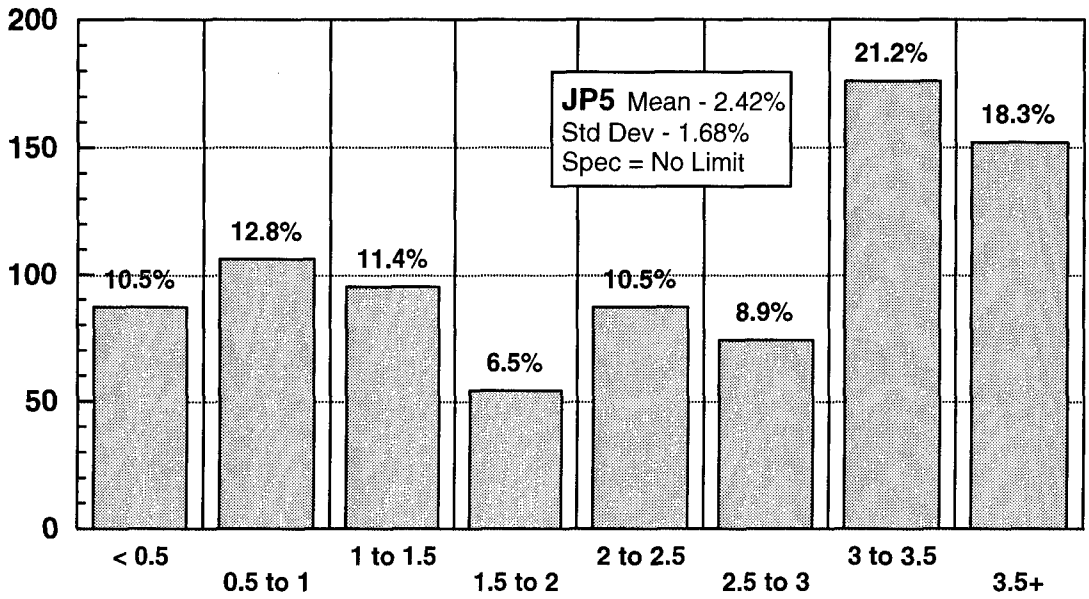


Chart 18

Distribution of Naphthalenes by Volume Received for 1997

(Millions of Gallons)



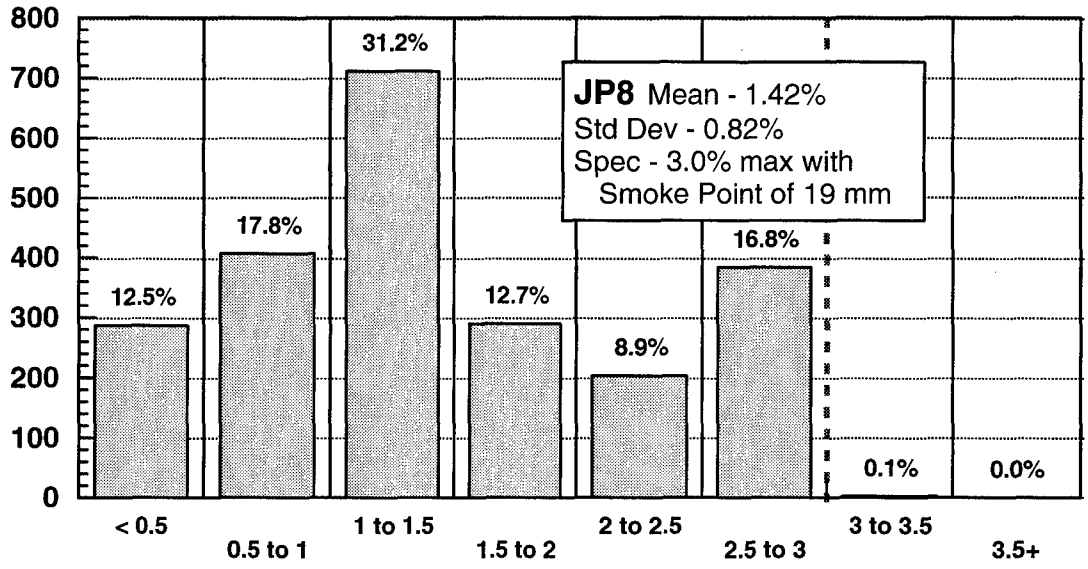
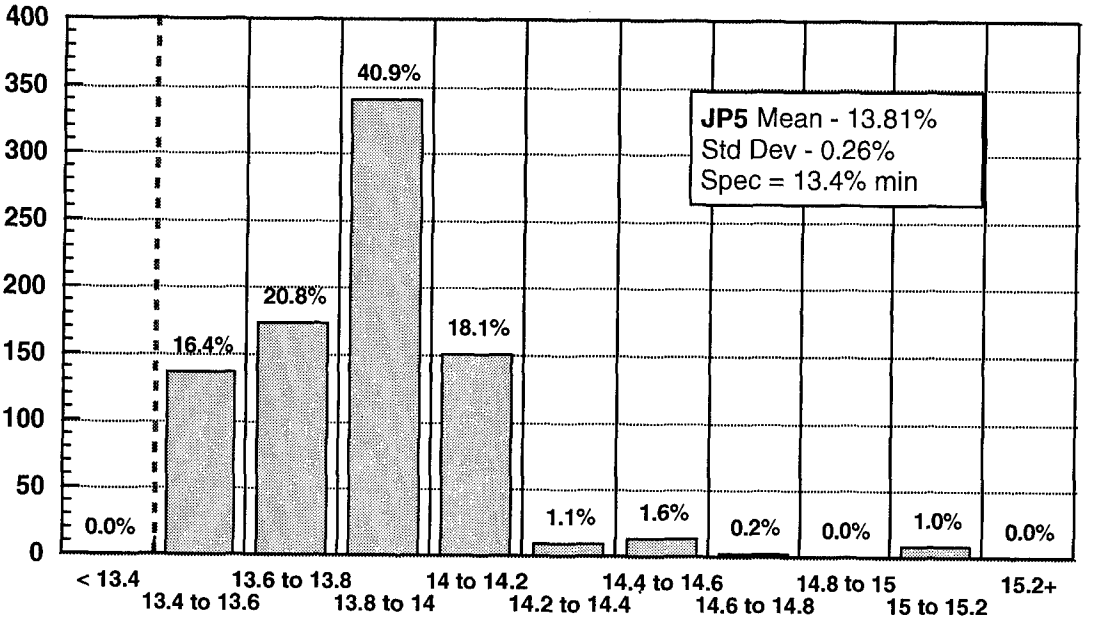


Chart 19

Distribution of Hydrogen Content by Volume Received for 1997

(Millions of Gallons)



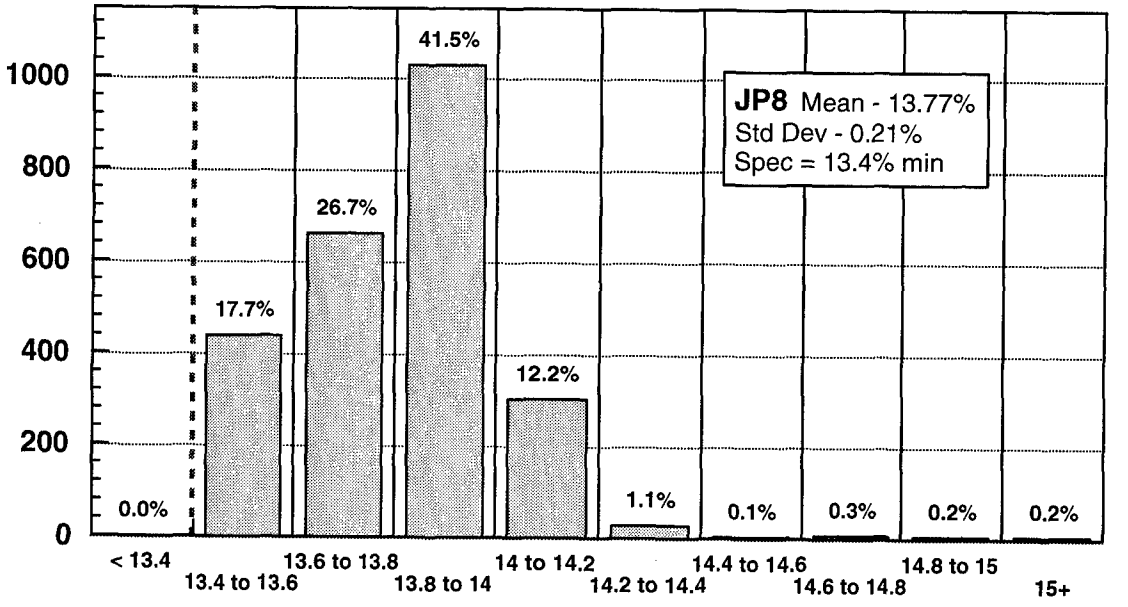
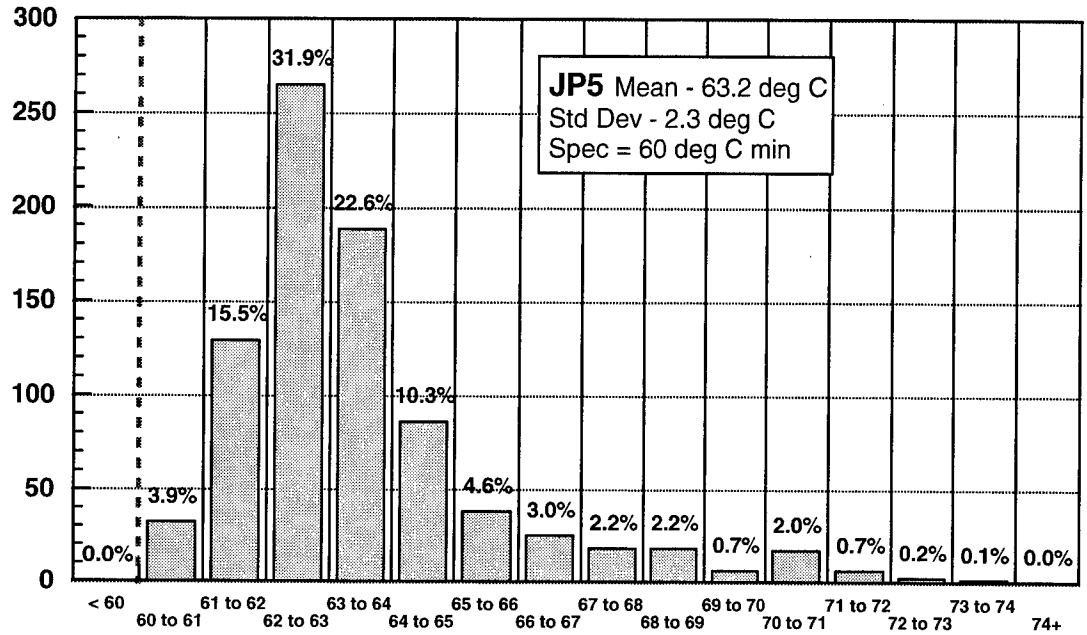


Chart 20

Distribution of Flash Point by Volume Received for 1997

(Millions of Gallons)



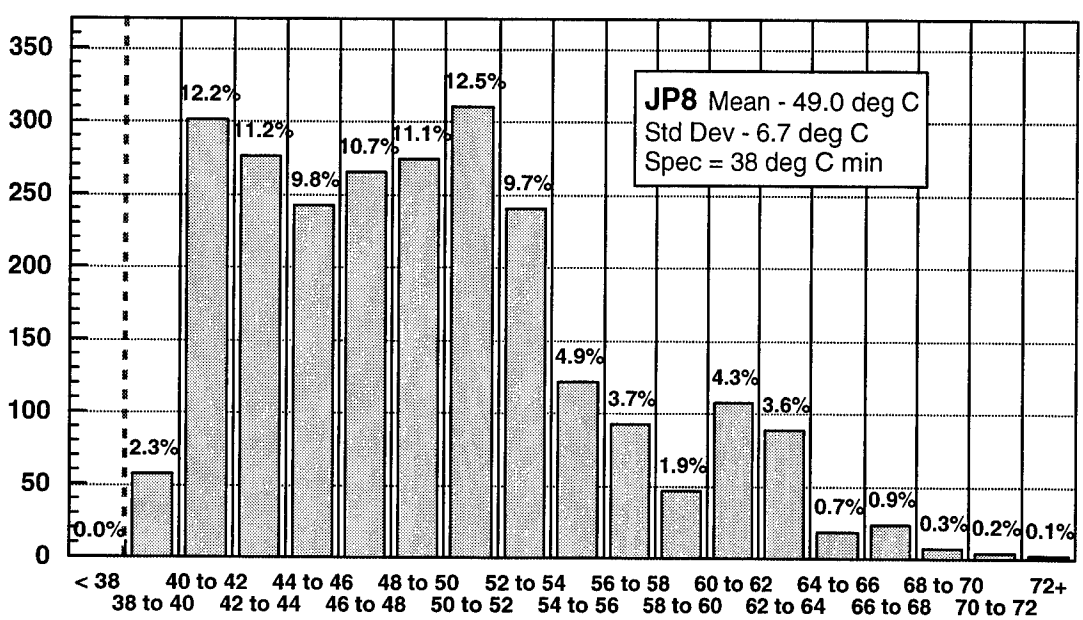
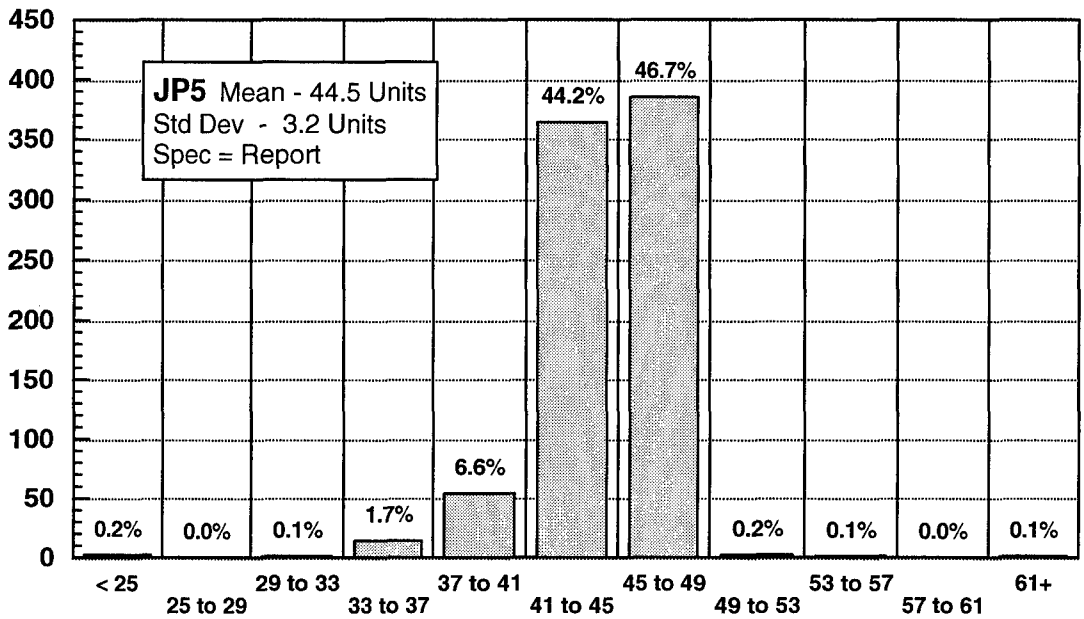
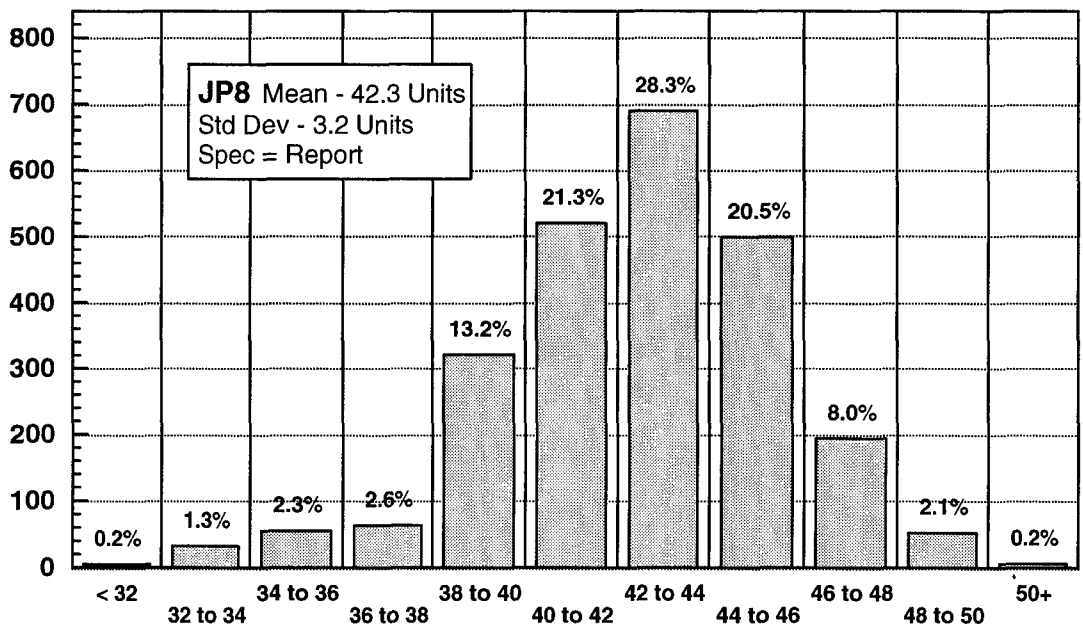


Chart 21

Distribution of Cetane Index by Volume Received for 1997

(Millions of Gallons)





Section IV - Conclusions

For those properties which are directly related to hydrocarbon composition, such as *API Gravity*, *Aromatics*, *Filtration Time*, *Smoke Point*, *Naphthalenes* and *Hydrogen Content*, the shape of the curve created by the bars in the histogram occurs in different data ranges in JP4 than for JP5/JP8. This demonstrates that the type of fuel being produced affects the differences in properties. The properties of *Olefins*, *Total Sulfur*, *Mercaptan Sulfur* and *Acid Number*, are consistent for JP4, JP5 and JP8, thus showing that these properties are controlled by the refining process techniques. Olefins are a side product of the various cracking and reforming reactions used to increase the useable portion of crude oil, and would thus be expected to fall into the latter category.

In the Appendix are Tables, which provide the minimum, average, weighted average and maximum values for a product property by fuel grade, year, and region. These Tables are used as a supplement to the histograms in Section II. This report provided three means for reporting a mid-range test result for each property for each Region and calendar year: the mean, the average and the volumetrically weighted average. Each calculation is based on a different focus, thus producing different results. Analysis of individual properties is provided below.

Mean values cited in the histograms in this report are compared to the values in the 1990-1996 Report, which covered 6 years worth of data. This data can be used to determine if an increase, decrease, or no change was apparent. The trends are summarized on the following pages for the key properties presented in this report. The charts show data for 1995 – 1997 subdivided by calendar year and region. A more detailed trend analysis can thus be done.

API Gravity

Data shows that all JP5 and JP8 reported were purchased within the specification range. The mean values for JP5 and JP8 did not shift much from the previous report. Over 50% of the JP5 purchased had an API Gravity range between 43 and 45. Regions 3 and 7 produced product with the highest API Gravity values for JP8. Regions 1 and 5 produced the heaviest JP5 and JP8.

Aromatics

Data shows that all JP5 and JP8 reported were purchased within specification. The mean values for both fuels decreased slightly. The JP5 standard deviation improved from 2.9% to 2.0% with a greater percentage of fuels falling within the 18% to 22% range. The shape of the JP8 curve changed from one maximum (at about 18%) to two maximums (at about 15% and 20%).

Olefins

Data shows that all JP5 and JP8 reported was purchased within specification. The mean values increased for JP5 and decreased for JP8. About 1% of the JP8 purchased was above 3.5% olefins. Regions 3 and 5 had the greatest amount of olefins for JP5 and JP8.

Total Sulfur

Data shows that all of the JP5 and JP8 reported purchased within specification. The mean sulfur values increased slightly for both JP5 and JP8. Regions of lowest average sulfur content are Regions 5, 6 and 8. Over half of the JP8 delivered had a sulfur content at or below 0.05%.

Mercaptan Sulfur

This test is not required if the Doctor Test is "Negative". The data presented would therefore be a subset of the total data points. For JP5, no values were above 0.0020%. For JP8, 6.5% of the volume purchased was 0.0020% and over. From Table 10, values of JP8 above 0.0020% appear in Regions 4 and 7. None of the maximums were above 0.0030%.

Particulate Contamination

Data shows that 99% of the JP5 and JP8 purchased was within specification. The mean value for JP8 is similar with similar standard deviations. About 74% of the JP5 and 62% of JP8 was purchased with a particulate contamination level below 0.4 mg/L.

Filtration Time

Data shows that all JP8 was purchased within the specification limits for filtration time. For JP5, 0.2% of the volume purchased was at the specification limit of 15 minutes. The mean values for JP5 and JP8 remained the same. The shape of the curves remains about the same.

Total Acid Number

Data shows that all of the JP4 and JP5 were purchased within the specification limits for total acid number. For JP8 (Table 16), acid numbers which exceeded the specification were reported from Region 8 for all years. The mean acid numbers decreased for JP5 and stayed the same for JP8.

Smoke Point

Data shows that all JP5 and JP8 purchased was within the specification limit for smoke point. The mean values for JP5 and JP8 remained the same. The JP8 specification allows a reduction from 25-mm minimum to 19-mm minimum for fuel having naphthalene content of 3.0% maximum. About 73% of the JP8 purchased were between 19 - 25 range.

Naphthalenes

Naphthalenes are reported for JP8 only when the smoke point is below 25 mm. Graphs in Chart 17 show all fuel shipments for which naphthalenes were reported. Only the JP8 values for region and year are detailed. There was no change in the mean values for JP8.

Hydrogen Content

Data shows that all JP5 and JP8 were purchased within the specification range for hydrogen content. The mean values for both JP5 and JP8 did not change. The shape of the curves for the Histograms remained the same.

Distillation

Distillation results were reported from Table 22 - Table 25 for those distillation requirements, which have a limiting value. No obvious trends are apparent.

Flash Point

Data shows all JP5 and JP8 was purchased within specification limits. The mean values for JP5 and JP8 did not change. Flash Point for JP5 did not exceed 74°C.

Cetane Index

The cetane index is a report only requirement. The mean value for JP5 rose slightly while the mean value for JP8 stayed the same. No obvious trends are apparent.

Net Heat of Combustion

The Net Heat can be reported in three different ways: the Aniline-API Gravity product or net heat reported in either British Thermal Units (BTUs) or in MilliJoules per kg (MJ/kg). No obvious trends are apparent.

Appendix - Tables of Property Values

The following tables are designed to show the minimum, average, volumetrically weighted average and maximum values for each fuel property of the specified grade of fuel. The values are broken down by calendar year and by region. Also supplied for each year and region combination is the volume, in millions of gallons, represented by the data as well as the number of reports that contained data in the field. These charts are designed to be "stand alone", with all the information contained within each chart to allow it to be separated from the main body of the report and still be useable.

Using these charts, it is possible to compare averages from different regions. For example, if a researcher desires a comparison in average API gravity of JP8, the researcher will go to Table 2 - "Values of JP8 for API Gravity by Region" (on the following page) and observe the values for Region 1 (East Coast) and compare those with Region 2 (East Central). The researcher would find that the fuel supplied in Region 1 tends to be lower in API Gravity than the fuel supplied in Region 2. The researcher would then evaluate the significance, if any, of this observation.

Table 1

Values of JP5 for API Gravity by Region

(Volume in Millions of Gallons)
(Spec = 36 - 48° API)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	3	JP5	55.5	37.1	42.77	42.79	44.2	33
1995	7	JP5	31.8	40.8	43.44	43.72	46.5	8
1996	3	JP5	308.9	37.2	43.60	43.69	47.8	111
1996	5	JP5	51.4	39.3	40.34	40.79	41.8	17
1996	6	JP5	22.7	44.1	45.13	44.98	45.7	3
1996	7	JP5	80.7	41.2	43.60	43.75	46.8	24
1996	8	JP5	39.6	44.4	45.11	45.12	46.0	8
1997	3	JP5	322.3	42.1	43.94	44.05	44.8	129
1997	5	JP5	209.4	36.6	39.90	40.59	43.1	73
1997	6	JP5	59.2	40.8	43.05	42.92	44.2	10
1997	7	JP5	55.8	41.1	43.44	43.52	45.9	19
1997	8	JP5	55.0	40.7	42.89	43.47	45.9	15

Table 2

Values of JP8 for API Gravity by Region

(Volume in Millions of Gallons)
(Spec = 37.0 - 51.0° API)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	1	JP8	2.9	40.9	42.79	42.91	44.7	30
1995	2	JP8	126.6	42.2	44.23	44.29	45	83
1995	3	JP8	451.5	41	44.29	44.38	48.7	316
1995	4	JP8	10.0	42.8	44.77	44.72	46.8	16
1995	5	JP8	239.3	39.7	41.76	42.00	44.1	154
1995	7	JP8	65.1	41.8	45.35	45.32	48.0	21
1995	8	JP8	97.41	41.9	43.04	43.12	46.1	118
1996	1	JP8	18.83	41.2	42.89	44.11	45.3	60
1996	2	JP8	191.4	41.4	44.35	44.22	46	148
1996	3	JP8	633.7	40.5	44.34	44.02	48.2	433
1996	4	JP8	84.9	42.4	45.31	45.20	47.2	96
1996	5	JP8	427.1	39.1	41.42	41.94	46	225
1996	6	JP8	37.28	45.9	46.19	46.18	46.3	7
1996	7	JP8	254.3	40.81	45.18	45.52	48.05	108
1996	8	JP8	176.0	42	43.91	45.80	50.1	152
1997	1	JP8	5.9	41.7	42.84	43.06	44	41
1997	2	JP8	204.6	42.3	44.27	44.19	46.8	293
1997	3	JP8	709.7	40.3	44.30	44.23	49.4	437
1997	4	JP8	53.3	42.2	45.68	45.92	46.9	86
1997	5	JP8	419.1	38.5	41.36	41.64	44.9	284
1997	7	JP8	248.7	39.5	45.59	45.77	48.02	89
1997	8	JP8	301.5	41.7	44.08	45.44	48.6	170

Table 3

Values of JP5 for Aromatics by Region

(Volume in Millions of Gallons)
(Spec = 25.0% max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	3	JP5	55.5	11.5	16.79	17.34	20.2	33
1995	7	JP5	31.7	19	20.06	20.11	21	8
1996	3	JP5	308.9	12.8	18.51	18.60	23.6	111
1996	5	JP5	51.4	19	20.47	20.56	22.9	17
1996	6	JP5	22.7	16.2	19.33	20.37	21.8	3
1996	7	JP5	80.7	15.6	18.61	18.53	20.7	24
1996	8	JP5	39.6	15.6	16.43	16.41	18.4	8
1997	3	JP5	322.3	11.8	18.41	18.76	20.6	129
1997	5	JP5	209.4	13	19.89	20.14	22.6	73
1997	6	JP5	59.2	18	19.46	19.34	20.7	10
1997	7	JP5	55.8	18.6	19.98	20.08	22.6	19
1997	8	JP5	55.0	14	16.78	16.79	19.6	15

Table 4

Values of JP8 for Aromatics by Region

(Volume in Millions of Gallons)
(Spec = 25.0% max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	1	JP8	2.9	17	19.25	19.12	20.7	30
1995	2	JP8	126.6	11	15.23	15.31	22.6	83
1995	3	JP8	451.5	7.1	17.57	17.81	24.8	316
1995	4	JP8	10.0	13.7	17.30	16.95	21.2	16
1995	5	JP8	239.3	10.9	20.79	18.50	25.0	154
1995	7	JP8	65.1	9.7	16.75	16.74	21.8	21
1995	8	JP8	97.4	10.1	18.3	17.94	22.0	118
1996	1	JP8	18.8	17.5	19.6	19.87	23.7	60
1996	2	JP8	191.4	11.1	14.64	14.97	21.5	148
1996	3	JP8	633.7	9.1	17.67	18.56	24.9	433
1996	4	JP8	84.9	13	17.65	17.89	22.9	96
1996	5	JP8	427.1	7.8	18.62	16.67	24.6	225
1996	6	JP8	37.3	15.8	16.01	16.00	16.3	7
1996	7	JP8	254.3	12.2	18.25	17.13	23.0	108
1996	8	JP8	176.0	13	18.41	17.15	21.1	152
1997	1	JP8	5.9	15.9	19.70	19.08	21.8	41
1997	2	JP8	204.6	7.9	14.55	14.51	21	293
1997	3	JP8	709.7	6.0	18.12	19.10	24.6	437
1997	4	JP8	53.3	13.1	16.52	15.92	22	86
1997	5	JP8	419.1	10.7	19.83	17.75	23.7	284
1997	7	JP8	248.7	13.5	17.23	16.68	23	89
1997	8	JP8	301.5	10.8	18.59	17.81	20.9	170

Table 5

Values of JP5 for Olefins by Region

(Volume in Millions of Gallons)
(Spec = 5.0% max, "S" Revision, No Requirement)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	3	JP5	55.5	0.5	0.97	0.99	2.1	33
1995	7	JP5	31.7	0.5	0.79	0.78	1.2	8
1996	3	JP5	308.9	0.1	0.91	0.89	2	111
1996	5	JP5	51.4	0.8	1.19	1.11	2	17
1996	6	JP5	22.7	0.3	0.37	0.39	0.5	3
1996	7	JP5	80.7	0.2	0.94	0.92	2	24
1996	8	JP5	39.6	0.6	0.79	0.78	1	8
1997	3	JP5	322.3	0.4	0.87	0.82	2.7	129
1997	5	JP5	209.4	0.6	1.71	1.66	4.8	73
1997	6	JP5	59.2	0.4	0.65	0.70	1.2	10
1997	7	JP5	55.8	0.5	1.17	1.13	2.2	19
1997	8	JP5	55.0	0.8	1.14	1.03	1.4	10

Table 6

Values of JP8 for Olefins by Region

(Volume in Millions of Gallons)
(Spec = 5.0% max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	1	JP8	2.9	0.4	1.23	1.24	2.1	30
1995	2	JP8	126.6	0.7	2.32	2.38	5	83
1995	3	JP8	451.5	0.3	1.24	1.31	4.6	314
1995	4	JP8	10.0	0.5	1	1.05	2.9	16
1995	5	JP8	239.3	0.6	2.17	2.34	4.4	154
1995	7	JP8	65.1	0.2	0.51	0.55	1.1	21
1995	8	JP8	97.4	0	0.89	0.91	4.1	71
1996	1	JP8	18.8	0.6	1.02	0.95	1.9	60
1996	2	JP8	191.4	0.8	1.70	1.95	5	148
1996	3	JP8	633.7	0.1	1.18	1.16	4.3	421
1996	4	JP8	84.9	0.2	0.97	0.92	3	90
1996	5	JP8	427.1	0.4	1.88	2.31	5	225
1996	6	JP8	37.3	0.3	0.3	0.3	0.3	7
1996	7	JP8	254.3	0.1	0.62	0.47	1.3	98
1996	8	JP8	176.0	0	0.55	0.37	3.1	132
1997	1	JP8	5.9	0.6	1.17	1.39	2.6	41
1997	2	JP8	204.6	-1	1.29	1.34	4.8	293
1997	3	JP8	709.7	0	1.25	1.16	4.4	437
1997	4	JP8	53.3	0.3	0.85	0.89	2.4	86
1997	5	JP8	419.1	0.3	1.49	2.00	4.7	284
1997	7	JP8	248.7	0.1	0.46	0.37	1.1	75
1997	8	JP8	301.5	0	0.38	0.20	3.5	170

Table 7

Values of JP5 for Total Sulfur by Region

(Volume in Millions of Gallons)

(Spec = 0.40% max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	3	JP5	55.5	0.000	0.0443	0.0513	0.110	33
1995	7	JP5	31.7	0.010	0.0138	0.0144	0.020	8
1996	3	JP5	308.9	0.000	0.0828	0.0838	0.140	111
1996	5	JP5	51.4	0.010	0.0120	0.0133	0.020	17
1996	6	JP5	22.7	0.010	0.0130	0.0140	0.019	3
1996	7	JP5	80.7	0.010	0.0358	0.0324	0.140	24
1996	8	JP5	39.6	0.010	0.0175	0.0174	0.030	8
1997	3	JP5	322.3	0.004	0.0915	0.0935	0.130	129
1997	5	JP5	209.4	0.000	0.0115	0.0126	0.150	73
1997	6	JP5	59.2	0.010	0.0100	0.0100	0.010	10
1997	7	JP5	55.8	0.004	0.0327	0.0253	0.150	19
1997	8	JP5	55.0	0.010	0.0307	0.0171	0.110	15

Table 8

Values of JP8 for Total Sulfur by Region

(Volume in Millions of Gallons)

(Spec = 0.30% max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	1	JP8	2.9	0.003	0.0143	0.0135	0.030	30
1995	2	JP8	126.6	0.030	0.0921	0.0873	0.26	83
1995	3	JP8	451.5	0.000	0.0506	0.0548	0.24	316
1995	4	JP8	10.0	0.010	0.0297	0.0300	0.06	16
1995	5	JP8	239.3	0	0.0368	0.0269	0.125	154
1995	7	JP8	65.1	0.008	0.0416	0.0451	0.16	21
1995	8	JP8	97.4	0.01	0.0725	0.0538	0.11	118
1996	1	JP8	18.8	0.007	0.0231	0.0308	0.05	60
1996	2	JP8	191.4	0.02	0.0851	0.0885	0.26	148
1996	3	JP8	633.7	0	0.0372	0.0378	0.21	433
1996	4	JP8	84.9	0.002	0.0300	0.0261	0.1	96
1996	5	JP8	427.1	0.0002	0.0452	0.0291	0.2	225
1996	6	JP8	37.3	0.009	0.0099	0.0099	0.01	7
1996	7	JP8	254.3	0.001	0.0842	0.1086	0.28	108
1996	8	JP8	176.0	0.001	0.0670	0.0480	0.11	152
1997	1	JP8	5.9	0.006	0.0244	0.0307	0.0736	41
1997	2	JP8	204.6	0.01	0.0923	0.0881	0.26	293
1997	3	JP8	709.7	0	0.0415	0.0361	0.16	437
1997	4	JP8	53.3	0.004	0.0281	0.0287	0.05	86
1997	5	JP8	419.1	0	0.0598	0.0313	0.2	284
1997	7	JP8	248.7	0.009	0.0980	0.1165	0.21	89
1997	8	JP8	301.5	0.001	0.0566	0.0495	0.12	170

Table 9

Values of JP5 for Mercaptan Sulfur by Region

(Volume in Millions of Gallons)
(Spec = 0.002% max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	3	JP5	55.5	0.0001	0.00057	0.00067	0.0015	33
1995	7	JP5	3.6	0.0002	0.0002	0.0002	0.0002	1
1996	3	JP5	308.9	0.0001	0.00098	0.00099	0.002	111
1996	5	JP5	30.2	0.0007	0.00105	0.00101	0.0017	6
1996	6	JP5	2.6	0.0004	0.00040	0.00040	0.0004	1
1996	7	JP5	49.3	0.0001	0.00046	0.00049	0.0017	17
1996	8	JP5	39.6	0.0009	0.00090	0.00090	0.0009	8
1997	3	JP5	322.3	0.0001	0.00072	0.00073	0.0013	129
1997	5	JP5	145.0	0.0001	0.00066	0.00073	0.0020	28
1997	7	JP5	34.0	0.0001	0.00019	0.00016	0.0006	13
1997	8	JP5	55.0	0.0001	0.00077	0.00086	0.0009	15

Table 10

Values of JP8 for Mercaptan Sulfur by Region

(Volume in Millions of Gallons)
(Spec = 0.002% max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	1	JP8	1.5	0.0001	0.00013	0.00013	0.0003	13
1995	2	JP8	61.0	0.0007	0.00136	0.00133	0.0020	42
1995	3	JP8	303.6	0.0001	0.00099	0.00113	0.002	240
1995	4	JP8	4.2	0.001	0.00154	0.00158	0.002	7
1995	5	JP8	237.8	0.0001	0.00054	0.00066	0.0019	151
1995	7	JP8	57.3	0.0001	0.00093	0.00110	0.0025	20
1995	8	JP8	55.1	0.0003	0.00056	0.00059	0.0008	92
1996	1	JP8	14.3	0.0003	0.00095	0.00076	0.0018	11
1996	2	JP8	137.3	0.0001	0.00127	0.00126	0.0020	117
1996	3	JP8	344.4	0.0001	0.00115	0.00123	0.0099	293
1996	4	JP8	51.9	0.0010	0.00173	0.00175	0.0030	70
1996	5	JP8	396.8	0.0001	0.00051	0.00060	0.0020	173
1996	6	JP8	37.3	0.0003	0.00037	0.00038	0.0004	7
1996	7	JP8	233.9	0.0003	0.00127	0.00128	0.0029	100
1996	8	JP8	63.8	0.0001	0.00054	0.00053	0.0020	125
1997	1	JP8	1.1	0.0014	0.00140	0.00140	0.0014	1
1997	2	JP8	192.2	0.0002	0.00122	0.00125	0.0019	285
1997	3	JP8	456.2	0.0001	0.00103	0.00098	0.0071	329
1997	4	JP8	52.9	0.0002	0.00171	0.00178	0.0030	85
1997	5	JP8	332.3	0.0001	0.00064	0.00078	0.0021	135
1997	7	JP8	248.1	0.00002	0.00100	0.00107	0.0025	88
1997	8	JP8	51.1	0.0004	0.00059	0.00059	0.0010	86

Table 11

Values of JP5 for Particulate Contamination by Region

(Volume in Millions of Gallons)
(Spec = 1.0 mg/L max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	3	JP5	55.5	0.03	0.316	0.234	1.00	33
1995	7	JP5	31.7	0.02	0.325	0.304	0.6	8
1996	3	JP5	308.9	0.03	0.145	0.145	0.8	110
1996	5	JP5	51.4	0.04	0.235	0.151	1	16
1996	6	JP5	22.7	0.26	0.36	0.308	0.52	3
1996	7	JP5	80.7	0.2	0.468	0.440	1	24
1996	8	JP5	39.6	0.4	0.65	0.659	0.9	8
1997	3	JP5	322.3	0.03	0.196	0.194	0.7	129
1997	5	JP5	209.4	0	0.170	0.136	0.6	73
1997	6	JP5	59.2	0.18	0.293	0.278	0.5	10
1997	7	JP5	55.8	0.13	0.436	0.405	0.8	19
1997	8	JP5	55.0	0.2	0.481	0.464	0.74	15

Table 12

Values of JP8 for Particulate Contamination by Region

(Volume in Millions of Gallons)
(Spec = 1.0 mg/L max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	1	JP8	2.9	0.1	0.320	0.293	0.7	30
1995	2	JP8	126.6	0.10	0.444	0.466	1	83
1995	3	JP8	451.5	0.03	0.335	0.311	1	312
1995	4	JP8	10.0	0.05	0.416	0.475	1	16
1995	5	JP8	239.3	0.1	0.189	0.271	1	154
1995	7	JP8	65.1	0.12	0.495	0.470	0.8	21
1995	8	JP8	97.4	0.05	0.355	0.364	0.98	116
1996	1	JP8	18.8	0.05	0.206	0.284	1	60
1996	2	JP8	191.4	0.05	0.4351	0.427	0.98	147
1996	3	JP8	633.7	0.013	0.346	0.298	1.2	428
1996	4	JP8	84.9	0.1	0.359	0.397	0.9	96
1996	5	JP8	427.1	0.01	0.280	0.326	1	225
1996	6	JP8	37.3	0.48	0.561	0.562	0.61	7
1996	7	JP8	254.3	0.03	0.344	0.397	1	97
1996	8	JP8	176.0	0.05	0.378	0.555	1	152
1997	1	JP8	5.9	0	0.180	0.191	1	41
1997	2	JP8	204.6	0.05	0.458	0.409	1	293
1997	3	JP8	709.7	0	0.341	0.312	1	437
1997	4	JP8	53.3	0.01	0.316	0.327	1	86
1997	5	JP8	419.1	0	0.285	0.344	1	284
1997	7	JP8	248.7	0.03	0.352	0.396	0.9	80
1997	8	JP8	301.5	0.05	0.434	0.580	1.1	170

Table 13

Values of JP5 for Filtration Time by Region

(Volume in Millions of Gallons)
(Spec = 15 minutes max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	3	JP5	55.5	2	5.2	3.85	15	33
1995	7	JP5	31.75	4	4.6	4.65	6	8
1996	3	JP5	308.9	2	3.1	3.1	6	111
1996	5	JP5	51.4	3	3.7	3.5	4	17
1996	6	JP5	22.7	8	8.7	8.9	10	3
1996	7	JP5	80.7	4	6.0	5.8	12	24
1996	8	JP5	39.6	3	4.4	4.4	7	8
1997	3	JP5	322.3	2	3.3	3.1	8	129
1997	5	JP5	209.4	3	4.3	4.2	12	73
1997	6	JP5	59.2	7	8.7	8.6	10	10
1997	7	JP5	55.8	4	6.5	6.7	11	19
1997	8	JP5	55.0	3	6.9	6.0	15	15

Table 14

Values of JP8 for Filtration Time by Region

(Volume in Millions of Gallons)
(Spec = 15 minutes max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	1	JP8	2.9	6	7.1	7.0	10	30
1995	2	JP8	126.6	3	7.3	7.0	13	82
1995	3	JP8	451.5	3	6.3	5.9	14	310
1995	4	JP8	10.0	6	8.1	8.0	10	16
1995	5	JP8	239.3	4	5.6	5.8	12	154
1995	7	JP8	65.1	4	7.0	7.4	13	21
1995	8	JP8	97.4	4	6.7	6.3	11	118
1996	1	JP8	18.8	3	7.1	4.3	12	60
1996	2	JP8	191.4	3	7.8	7.7	13	147
1996	3	JP8	633.7	3	6.4	6.4	13	428
1996	4	JP8	84.9	4	7.2	7.0	11	96
1996	5	JP8	427.1	3	6.4	7.1	14	225
1996	6	JP8	37.3	8	8.3	8.3	9	7
1996	7	JP8	254.3	3	6.4	6.6	14	98
1996	8	JP8	176.0	4	7.2	70.	14	152
1997	1	JP8	5.9	5	8.4	7.7	11	41
1997	2	JP8	204.6	5	7.6	7.3	14	293
1997	3	JP8	709.7	3	6.7	6.7	14	437
1997	4	JP8	53.3	5	7.5	7.3	14	86
1997	5	JP8	419.1	3	5.2	6.2	15	284
1997	7	JP8	248.7	5	7.7	7.3	14	80
1997	8	JP8	301.5	4	6.7	7.3	11	170

Table 15

Values of JP5 for Total Acid Number by Region

(Volume in Millions of Gallons)
(Spec = 0.015 mg KOH/g max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	3	JP5	55.5	0.001	0.0050	0.0038	0.011	33
1995	7	JP5	31.7	0.004	0.0060	0.0059	0.009	8
1996	3	JP5	308.9	0.0005	0.0032	0.0031	0.013	110
1996	5	JP5	51.4	0.003	0.0056	0.0062	0.014	17
1996	6	JP5	22.7	0.003	0.0039	0.0033	0.0058	3
1996	7	JP5	80.7	0.002	0.0045	0.0046	0.009	24
1996	8	JP5	39.6	0.003	0.0048	0.0048	0.007	8
1997	3	JP5	322.3	0.001	0.0031	0.0030	0.009	129
1997	5	JP5	209.4	0.000	0.0049	0.0059	0.013	72
1997	6	JP5	59.2	0.003	0.0044	0.0047	0.008	10
1997	7	JP5	55.8	0.001	0.0051	0.0054	0.008	19
1997	8	JP5	55.0	0.001	0.0084	0.0063	0.020	15

Table 16

Values of JP8 for Total Acid Number by Region

(Volume in Millions of Gallons)
(Spec = 0.015 mg KOH/g max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	1	JP8	2.9	0.001	0.0024	0.0023	0.01	30
1995	2	JP8	126.6	0.002	0.0053	0.0053	0.012	83
1995	3	JP8	451.5	0.0006	0.0035	0.0034	0.012	316
1995	4	JP8	10.0	0.003	0.0065	0.0063	0.013	16
1995	5	JP8	239.3	0.001	0.0025	0.0028	0.013	154
1995	7	JP8	65.1	0.0018	0.0047	0.0050	0.009	21
1995	8	JP8	97.4	0.001	0.0015	0.0011	0.02	118
1996	1	JP8	18.8	0.001	0.0041	0.0066	0.012	60
1996	2	JP8	191.4	0.001	0.0053	0.0055	0.014	146
1996	3	JP8	633.7	0.0001	0.0044	0.0039	0.04	433
1996	4	JP8	84.9	0.001	0.0057	0.0055	0.015	95
1996	5	JP8	427.1	0.001	0.0038	0.0040	0.015	225
1996	6	JP8	37.3	0.005	0.0059	0.0059	0.006	7
1996	7	JP8	254.3	0.001	0.0054	0.0056	0.015	108
1996	8	JP8	176.0	0.001	0.0014	0.0085	0.02	152
1997	1	JP8	5.9	0.001	0.0038	0.0033	0.0084	41
1997	2	JP8	204.6	0.0002	0.0044	0.0046	0.014	293
1997	3	JP8	709.7	0.001	0.0038	0.0034	0.017	437
1997	4	JP8	53.3	0.001	0.0060	0.0062	0.014	86
1997	5	JP8	419.1	0.001	0.0045	0.0040	0.013	283
1997	7	JP8	248.7	0.001	0.0034	0.0038	0.0095	89
1997	8	JP8	301.5	0.001	0.0125	0.0093	0.02	170

Table 17

Values of JP5 for Smoke Point by Region

(Volume in Millions of Gallons)

(Spec = 19.0 mm max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	3	JP5	14.7	19	21.25	20.57	25	14
1995	7	JP5	13.9	21	21.00	21.00	21	3
1996	3	JP5	235.1	18	19.95	19.94	22	87
1996	5	JP5	51.4	19.3	19.98	20.17	21	17
1996	6	JP5	22.7	21	24.33	23.45	27	3
1996	7	JP5	62.3	21	22.32	22.02	25	19
1996	8	JP5	39.6	21	23.00	23.01	24	8
1997	3	JP5	322.3	19	20.70	20.30	26	129
1997	5	JP5	209.4	19	19.95	20.22	22.5	73
1997	6	JP5	59.2	21	22.40	22.19	24	10
1997	7	JP5	55.8	21	22.27	21.92	25	19
1997	8	JP5	55.0	19.7	22.74	23.19	25	15

Table 18

Values of JP8 for Smoke Point by Region

(Volume in Millions of Gallons)

(Spec = 25 mm min or 19 min w/ 3.0% Naphthalenes)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	1	JP8	2.9	20.2	22.3	22.42	28.8	30
1995	2	JP8	126.6	20	24.33	24.00	26	82
1995	3	JP8	451.5	20	23.0	22.29	33	314
1995	4	JP8	10.0	21	23.32	23.62	27	16
1995	5	JP8	239.3	19	20.24	20.68	23	154
1995	7	JP8	65.1	19	25.29	25.37	29	21
1995	8	JP8	97.4	19.5	21.13	21.19	28.4	117
1996	1	JP8	18.8	20	21.60	22.36	23.1	60
1996	2	JP8	191.4	20	24.51	24.3	27.7	148
1996	3	JP8	633.7	19	23.22	22.14	30	433
1996	4	JP8	84.9	20	24.48	24.47	29	96
1996	5	JP8	427.1	19	20.28	20.58	27	225
1996	6	JP8	37.3	27	27	27	27	7
1996	7	JP8	254.3	19	23.61	24.45	27	108
1996	8	JP8	176.0	19.5	22.013	23.45	25	152
1997	1	JP8	5.9	20	21.57	21.83	23.5	41
1997	2	JP8	204.6	21	25.32	25.04	29	293
1997	3	JP8	709.8	19	22.947	22.09	29	437
1997	4	JP8	53. 3	21	26.11	26.85	29	86
1997	5	JP8	419.1	19	20.09	20.564	25	284
1997	7	JP8	248.7	19	24.41	24.65	27	89
1997	8	JP8	301.5	19.4	21.76	23.15	26.2	170

Table 19

Values of JP8 for Naphthalene by Region

(Volume in Millions of Gallons)

(Spec = 3.0% max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	1	JP8	2.9	0.5	0.89	0.87	1.7	30
1995	2	JP8	94.2	0.8	1.23	1.21	2	62
1995	3	JP8	450.9	0.1	1.24	1.13	2.9	315
1995	4	JP8	5.1	0.1	0.67	0.79	1.06	9
1995	5	JP8	239.3	0.2	1.79	1.36	2.98	154
1995	7	JP8	32.13	0.2	1.55	1.96	3	10
1995	8	JP8	97.39	0.1	2.14	1.64	2.94	118
1996	1	JP8	18.8	0.8	1.38	2.00	2.87	60
1996	2	JP8	148.1	0.6	1.33	1.33	2.9	116
1996	3	JP8	583.8	0.1	1.28	1.21	3	383
1996	4	JP8	34.5	0.7	1.04	1.00	1.7	24
1996	5	JP8	417.0	0.1	1.39	0.90	2.98	223
1996	6	JP8	27.29	0.52	0.52	0.52	0.53	5
1996	7	JP8	121.3	0.1	1.57	1.54	2.9	73
1996	8	JP8	162.1	0.3	2.163	1.15	2.98	135
1997	1	JP8	5.9	0.9	1.14	1.13	3	41
1997	2	JP8	157.1	0.1	1.32	1.30	1.67	179
1997	3	JP8	633.8	0.07	1.09	1.08	2.9	371
1997	4	JP8	0.6	0.09	0.55	0.18	1.3	7
1997	5	JP8	408.2	0.1	1.78	1.04	2.97	280
1997	7	JP8	132.4	0.09	1.54	1.57	2.9	60
1997	8	JP8	301.5	0.1	1.67	1.16	2.93	170

Table 20

Values of JP5 for Hydrogen Content by Region

(Volume in Millions of Gallons)
(Spec = 13.4% min)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	3	JP5	55.5	13.6	13.86	13.84	14.1	33
1995	7	JP5	31.7	13.7	13.85	13.86	14	8
1996	3	JP5	308.9	13.5	13.94	13.95	14.6	111
1996	5	JP5	51.4	13.4	13.60	13.70	14.36	17
1996	6	JP5	22.7	13.7	13.92	13.81	14.25	3
1996	7	JP5	80.7	13.4	14.04	14.06	15.1	24
1996	8	JP5	39.6	13.7	13.81	13.81	13.9	8
1997	3	JP5	322.3	13.4	13.97	13.97	14.4	129
1997	5	JP5	209.4	13.4	13.59	13.65	14.1	73
1997	6	JP5	59.2	13.6	13.78	13.75	14	10
1997	7	JP5	55.8	13.6	13.81	13.82	14.06	19
1997	8	JP5	55.0	13.6	13.78	13.76	13.9	15

Table 21

Values of JP8 for Hydrogen Content by Region

(Volume in Millions of Gallons)
(Spec = 13.4% min)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	1	JP8	2.9	13.5	13.60	13.61	13.8	30
1995	2	JP8	126.6	13.6	13.87	13.88	14.05	83
1995	3	JP8	451.5	13.4	13.79	13.79	14.5	316
1995	4	JP8	10.0	13.6	13.81	13.83	14	16
1995	5	JP8	239.3	13.4	13.56	13.62	14.5	154
1995	7	JP8	65.1	13.7	13.89	13.90	14.2	21
1995	8	JP8	97.4	13.5	13.80	13.84	14.2	118
1996	1	JP8	18.81	13.5	13.643	13.78	14.34	60
1996	2	JP8	191.4	13.5	13.89	13.87	14.8	148
1996	3	JP8	633.67	13.4	13.78	13.74	14.7	433
1996	4	JP8	84.9	13.4	13.80	13.78	14.1	96
1996	5	JP8	427.1	13.4	13.61	13.69	14.2	225
1996	6	JP8	37.3	14	14.07	14.08	14.2	7
1996	7	JP8	254.3	13.4	13.86	13.93	14.7	108
1996	8	JP8	176.03	13.4	13.89	13.95	14.2	152
1997	1	JP8	5.9	13.5	13.9	13.87	14	41
1997	2	JP8	204.6	13.6	13.88	13.88	14.38	293
1997	3	JP8	709.7	13.4	13.75	13.72	14.29	437
1997	4	JP8	53.3	13.59	13.85	13.89	14	86
1997	5	JP8	419.1	13.4	13.54	13.63	13.9	284
1997	7	JP8	248.7	13.52	14.03	14.03	15.2	89
1997	8	JP8	301.5	13.4	13.92	13.90	14.1	170

Table 22

Values of JP5 for Distillation 10% Recovered by Region

(Volume in Millions of Gallons)

(Spec = 205°C max, "R" Revision = 206°C max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	3	JP5	55.5	171	181.93	178.43	198	33
1995	7	JP5	31.7	186	196.00	195.10	203	8
1996	3	JP5	308.9	169	173.44	173.14	194	111
1996	5	JP5	51.4	169	190.71	185.27	200	17
1996	6	JP5	22.7	164	181.333	187.05	190	3
1996	7	JP5	80.7	170	190.5	189.78	200	24
1996	8	JP5	39.6	186	189.08	189.056	195	8
1997	3	JP5	322.3	156	174.06	172.58	201	129
1997	5	JP5	209.4	170	191.42	183.92	202	73
1997	6	JP5	59.2	189	191.3	191.48	193	10
1997	7	JP5	55.8	180.1	193.36	192.69	202.5	19
1997	8	JP5	55.0	189.5	192.75	193.41	198	15

Table 23

Values of JP8 for Distillation 10% Recovered by Region

(Volume in Millions of Gallons)

(Spec = 205°C max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	1	JP8	2.9	177	185.4	184.91	197	30
1995	2	JP8	126.6	176	182.91	182.85	190.9	83
1995	3	JP8	451.5	150	180.68	178.65	194	316
1995	4	JP8	10.0	171	178.38	178.01	188	16
1995	5	JP8	239.3	141	154.14	158.60	190	154
1995	7	JP8	65.1	164	176.80	178.29	198.1	21
1995	8	JP8	97.4	160	167.50	166.01	175	118
1996	1	JP8	18.8	167	183.93	174.41	197	60
1996	2	JP8	191.4	167.8	179.79	180.21	191	148
1996	3	JP8	633.7	157	179.40	179.43	197	433
1996	4	JP8	84.94	152	170.04	170.10	188	96
1996	5	JP8	427.1	148	166.97	164.02	198	225
1996	6	JP8	37.3	162	165.29	165.03	168	7
1996	7	JP8	254.3	164.4	172.10	172.54	185	108
1996	8	JP8	176.0	158	165.9	166.71	183	152
1997	1	JP8	5.9	177	183.20	184.33	191	41
1997	2	JP8	204.6	174.4	181.74	181.53	197	293
1997	3	JP8	709.7	126.11	177.86	177.42	200	437
1997	4	JP8	53.3	156	167.06	165.02	193	86
1997	5	JP8	419.2	148	171.49	167.26	201	284
1997	7	JP8	248.7	151.8	171.66	171.68	193	89
1997	8	JP8	301.5	157	167.37	170.52	195	170

Table 37

Values of JP5 for Final Boiling Point by Region

(Volume in Millions of Gallons)
(Spec = 300°C max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	3	JP5	55.5	245.6	269.04	273.03	287	33
1995	7	JP5	31.7	244	255.05	254.37	262.5	8
1996	3	JP5	308.9	254	278.33	278.22	286	111
1996	5	JP5	51.4	255	274.9	285.57	312	17
1996	6	JP5	22.7	250	266.67	258.99	290	3
1996	7	JP5	80.7	233.4	252.49	252.17	272	24
1996	8	JP5	39.6	253	262.35	262.22	274	8
1997	3	JP5	322.3	263	279.34	279.74	289	129
1997	5	JP5	209.4	250	275.47	290.35	309	73
1997	6	JP5	59.2	259	266.4	266.74	278	10
1997	7	JP5	55.8	234	255.76	255.67	273	19
1997	8	JP5	55.0	238.5	254.46	247.03	280	15

Table 38

Values of JP8 for Final Boiling Point by Region

(Volume in Millions of Gallons)
(Spec = 300°C max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	1	JP8	2.9	256	265.1	264.68	279	30
1995	2	JP8	126.6	246	255.33	255.31	271.6	83
1995	3	JP8	451.5	214.4	263.49	265.11	283	316
1995	4	JP8	10.0	236	255.38	256.54	289	16
1995	5	JP8	239.3	208.6	301.57	293.65	330	154
1995	7	JP8	65.1	233	246.72	248.50	260.6	21
1995	8	JP8	97.4	264	274.88	277.45	296	118
1996	1	JP8	18.8	250	261.68	256.95	272	60
1996	2	JP8	191.4	221	255.07	255.07	275	148
1996	3	JP8	633.7	92.8	261.26	263.79	284.4	433
1996	4	JP8	84.9	235	260.47	262.35	276	96
1996	5	JP8	427.1	255	289.56	292.10	319	225
1996	6	JP8	37.3	278	282.14	282.25	288	7
1996	7	JP8	254.3	231	255.00	254.80	300	108
1996	8	JP8	176.0	248	272.92	271.21	290	152
1997	1	JP8	5.9	244	261.37	257.70	278	41
1997	2	JP8	204.6	232	254.66	254.26	266.67	293
1997	3	JP8	709.73	237.78	263.56	264.53	300	437
1997	4	JP8	53.28	237	262.82	263.70	295	86
1997	5	JP8	419.1	242	280.33	285.03	313	284
1997	7	JP8	248.7	236	257.47	257.74	276	89
1997	8	JP8	301.5	257	275.54	274.03	293	170

Table 26

Values of JP5 for Flash Point by Region

(Volume in Millions of Gallons)
(Spec = 60°C min)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	3	JP5	55.5	60	62.34	61.93	65.56	33
1995	7	JP5	31.7	61	67.25	66.71	72	8
1996	3	JP5	308.9	60	62.04	62.04	65	111
1996	5	JP5	51.36	60	61.53	61.91	63	17
1996	6	JP5	22.7	62	62.33	62.44	63	3
1996	7	JP5	80.7	46	62.96	62.62	70	24
1996	8	JP5	39.6	62	62.88	62.83	65	8
1997	3	JP5	322.3	60	62.44	62.05	72.22	129
1997	5	JP5	209.4	60	62.64	62.77	69	73
1997	6	JP5	59.2	61	63.4	63.56	65	10
1997	7	JP5	55.8	61	65.42	65.42	73	19
1997	8	JP5	55.0	61	63.33	63.76	67	15

Table 27

Values of JP8 for Flash Point by Region

(Volume in Millions of Gallons)
(Spec = 38°C min)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	1	JP8	2.9	40	52.8	52.39	63	30
1995	2	JP8	126.6	40	51.65	51.77	58.9	83
1995	3	JP8	451.5	38	50.73	50.22	63.33	316
1995	4	JP8	10.0	43	47.20	46.98	51.1	16
1995	5	JP8	239.3	43.9	49.52	50.52	63	154
1995	7	JP8	65.1	42	49.93	50.50	69	21
1995	8	JP8	97.4	38	41.01	40.69	46	118
1996	1	JP8	18.8	40	49.48	43.15	60	60
1996	2	JP8	191.4	42.2	50.66	50.88	65.6	148
1996	3	JP8	633.7	37.8	50.00	50.00	70	433
1996	4	JP8	84.9	37.8	44.80	44.52	64.4	96
1996	5	JP8	427.1	40	48.90	50.02	62	225
1996	6	JP8	37.3	43	45.71	45.62	51	7
1996	7	JP8	254.3	38.5	44.82	45.92	62	108
1996	8	JP8	176.0	38	42.00	43.71	50	152
1997	1	JP8	5.9	43	50.56	51.62	74	41
1997	2	JP8	204.6	45.6	53.74	53.21	65.6	293
1997	3	JP8	709.7	38	51.51	50.28	76.7	437
1997	4	JP8	53.3	38	44.53	43.11	63.3	86
1997	5	JP8	419.1	40	48.38	48.94	64	284
1997	7	JP8	248.69	39.5	46.52	46.79	63	89
1997	8	JP8	301.5	39	44.41	47.03	59	170

Table 28

Values of JP5 for Cetane Index by Region

(Volume in Millions of Gallons)
(Spec = Report)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	3	JP5	55.5	36	45.22	45.34	48	33
1995	7	JP5	31.7	41.1	44.54	44.67	46	8
1996	3	JP5	308.9	24.9	46.81	47.00	59.4	111
1996	5	JP5	51.4	39	42.66	43.16	47.1	17
1996	6	JP5	22.7	44.4	45.8	45.40	47	3
1996	7	JP5	80.7	39	43.84	43.85	47.5	24
1996	8	JP5	39.6	40	45.63	45.64	49	8
1997	3	JP5	322.3	44.3	47.43	47.58	49.1	129
1997	5	JP5	209.4	33.7	41.85	42.74	46	73
1997	6	JP5	59.2	42.4	44.21	44.14	45.2	10
1997	7	JP5	55.8	42.4	45.35	45.02	56.5	19
1997	8	JP5	55.0	39.5	42.81	41.90	49	13

Table 29

Values of JP8 for Cetane Index by Region

(Volume in Millions of Gallons)
(Spec = Report)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1995	1	JP8	2.9	37.6	40.08	40.00	42.6	30
1995	2	JP8	126.6	42.3	44.78	39.92	47	76
1995	3	JP8	451.5	35.5	43.7	42.85	49.1	316
1995	4	JP8	10.0	39	43.49	43.76	45.6	16
1995	5	JP8	239.3	37	41.49	40.84	43	154
1995	7	JP8	65.1	34	42.95	43.97	47	21
1995	8	JP8	97.4	27.4	41.9	41.09	49	118
1996	1	JP8	18.8	37.3	41.09	9.86	44.9	49
1996	2	JP8	191.4	39	44.00	44.04	46.3	148
1996	3	JP8	633.7	35.7	43.67	43.26	56	432
1996	4	JP8	84.9	35	41.50	41.50	46.1	96
1996	5	JP8	427.0	38	40.83	40.84	45	225
1996	6	JP8	37.3	44.5	46	46.05	49	7
1996	7	JP8	254.3	37	43.60	39.19	52	86
1996	8	JP8	176.03	37.1	41.53	42.72	47.42	152
1997	1	JP8	5.9	37.7	40.03	40.85	44.8	41
1997	2	JP8	204.6	26	43.61	43.81	46.9	293
1997	3	JP8	709.7	21	41.69	41.55	49.9	437
1997	4	JP8	53.3	38	40.95	41.00	45.4	86
1997	5	JP8	419.1	35	40.66	39.47	49.5	282
1997	7	JP8	248.7	38	44.14	43.92	48.1	87
1997	8	JP8	301.5	35.3	42.22	45.07	59.3	170

Table 30

Values of JP5 for Net Heat of Combustion by Region

(Volume in Millions of Gallons)

(Spec Aniline-Gravity = 4500 min, Net Heat = 18300 BTU or 42.6 MJ/kg min)

Year	Region	Fuel	AG Min	AG Avg	AG Max	BTU Min	BTU Avg	BTU Max	MJ Min	MJ Avg	MJ Max
1995	3	JP5	5009	6048.8	6408	18557	18586.8	18608			
1995	7	JP5	5859	6367.1	6688						
1996	3	JP5	4899	6150.9	6525	18582	18582	18582			
1996	5	JP5	5224	5520.5	6014				41.6	42.78	43.1
1996	6	JP5	6086	6242	6398				43.39	43.39	43.39
1996	7	JP5	5894	6186.5	6658				42.23	43.03	43.3
1996	8	JP5							40.4	42.94	43.4
1997	3	JP5	5711	6217	6442	18431	18573.6	18615			
1997	5	JP5	4931	5403.9	6249				43	43.02	43.1
1997	6	JP5	5569	6066.3	6254						
1997	7	JP5	5710	6136.2	6600				43.2	43.22	43.24
1997	8	JP5							43	43.2	43.3

Table 31

Values of JP8 for Net Heat of Combustion by Region

(Volume in Millions of Gallons)

(Spec Net Heat = 18400 BTU or 42.8 MJ/kg min)

Year	Region	Fuel	AG Min	AG Avg	AG Max	BTU Min	BTU Avg	BTU Max	MJ Min	MJ Avg	MJ Max
1995	1	JP8							43.1	43.14	43.2
1995	2	JP8	5913	6152.8	7352	18540	18612.9	18645	43.1	43.18	43.2
1995	3	JP8	5913	6273.8	6825	18523	18616.4	19188	42.8	43.21	43.8
1995	4	JP8				18557	18602.8	18632	43.2	43.22	43.3
1995	5	JP8	5828	6262.7	6396	18483	18523.2	18611	43	43.04	43.06
1995	7	JP8	5913	5913	5913				43.2	43.26	43.7
1995	8	JP8	5913	5913	5913	18514	18557.6	18689	42.8	43.24	43.4
1996	1	JP8							43.1	43.14	43.3
1996	2	JP8				18500	18609.8	18647	43.1	43.21	43.3
1996	3	JP8	6322	6357	6402	15585	18572.7	18950	43	43.23	43.4
1996	4	JP8				18544	18602.9	18649	42.8	43.17	43.2
1996	5	JP8	5857	6225.7	6913	15566	18505.6	18984	43	43.03	43.1
1996	6	JP8							43.35	43.37	43.4
1996	7	JP8	5571	5947.5	6283				43.1	43.23	43.4
1996	8	JP8	5665	5692	5719	15589	18502.1	18999	43.1	43.64	46.7
1997	1	JP8							4.3	42.18	43.4
1997	2	JP8				18510	18606.3	18724	43.2	43.23	43.3
1997	3	JP8				18503	18592.4	19605	43	43.22	43.7
1997	4	JP8				18539	18602.0	18646	43.2	43.29	43.35
1997	5	JP8	5819	6060.3	6258	18487	18547.4	18857	43	43.04	43.1
1997	7	JP8	5749	6148	6488	18601	18616	18648	43.1	43.32	45.5
1997	8	JP8				18505	18615.1	19646	43.2	43.58	48.8

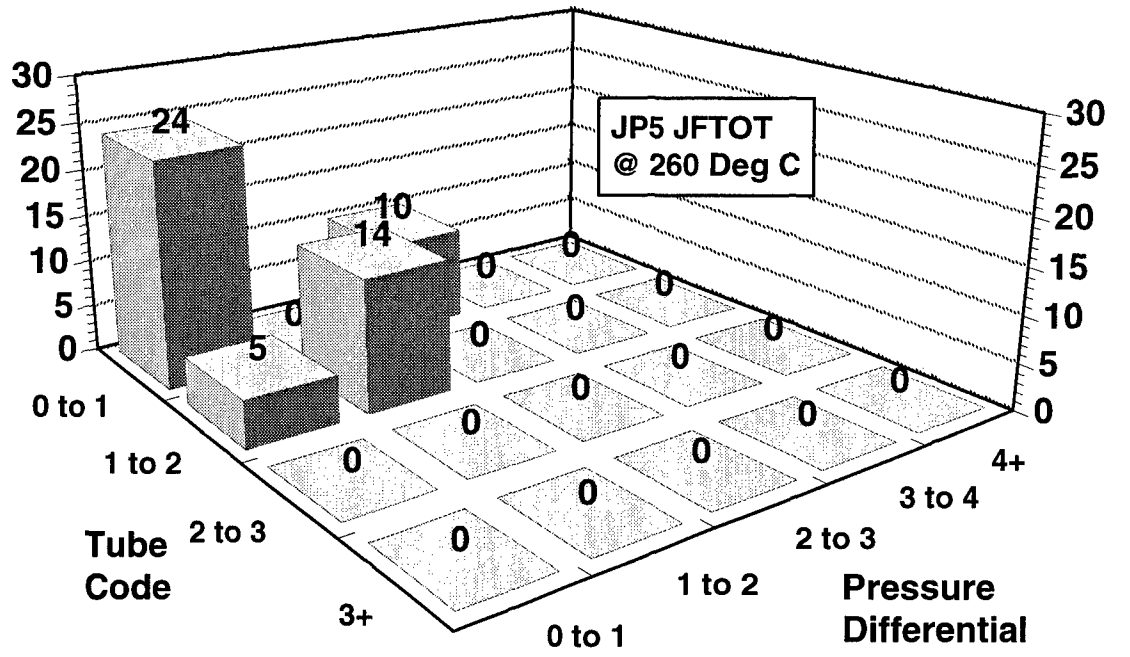
Special Report on
Jet Fuel Thermal Oxidation Stability Tester (JFTOT)
Test Results for
Test Temperatures of 260°C and 275°C

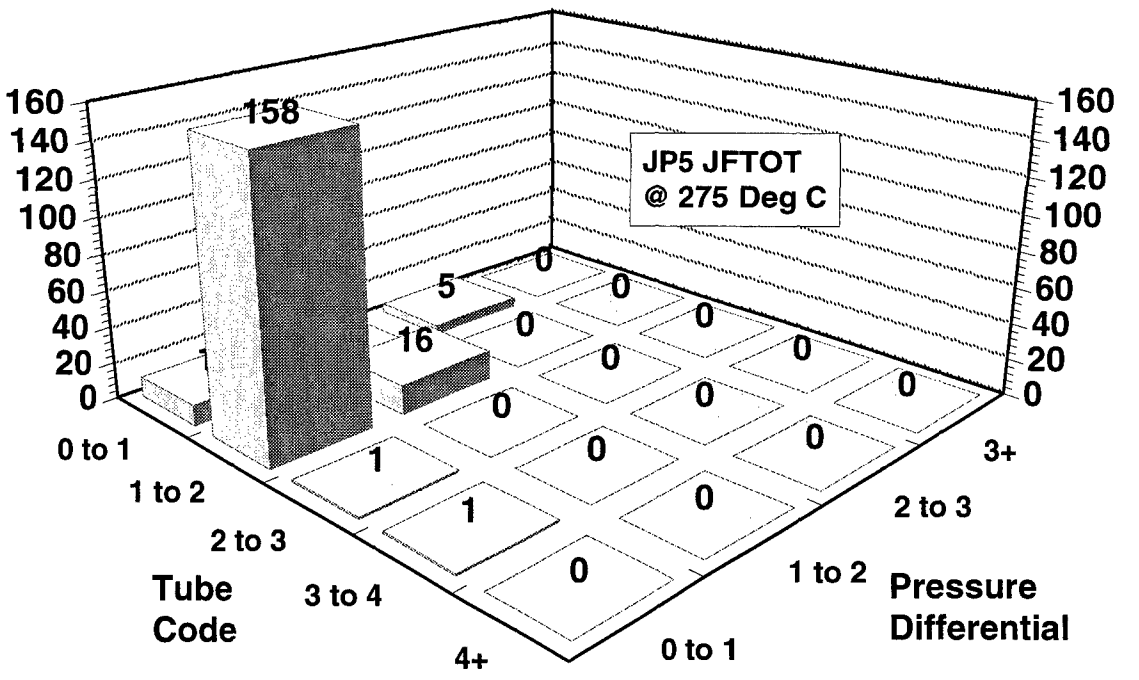
At the December 1998 ASTM Meeting, the issue of comparison of JFTOT results with the test temperature of 260°C and also at 275°C was discussed. In light of this discussion, the following charts are presented which represents JFTOT results for both JP5 and JP8 reported at each of the two test temperatures. Test results were for only one of the test temperatures; there were no reports two tests on the same sample done at different temperatures.

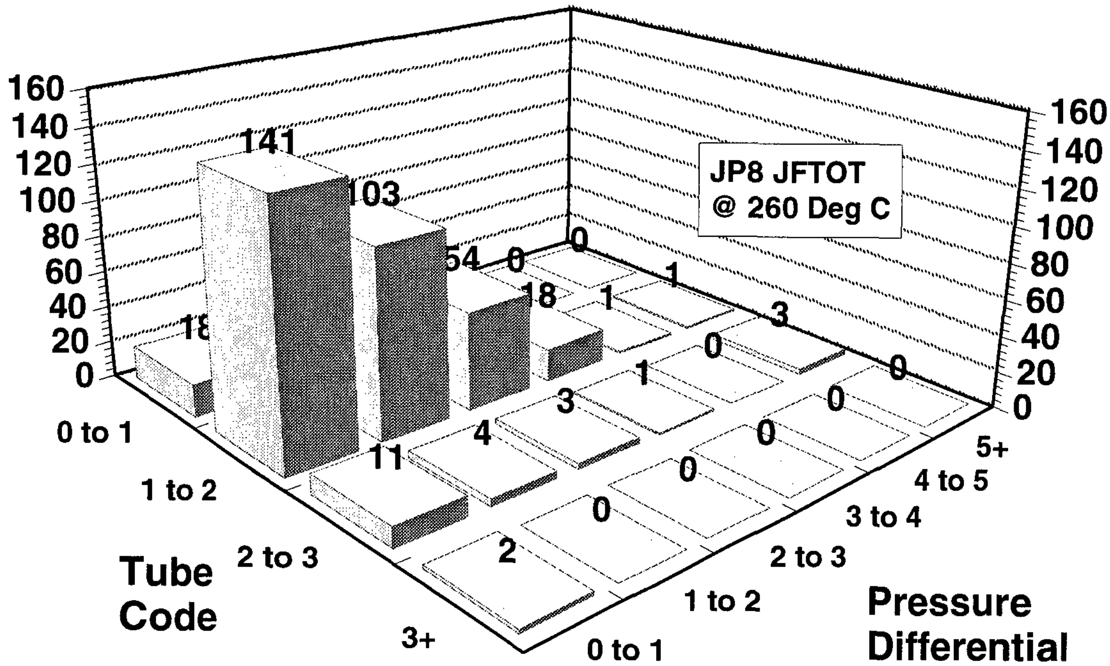
JFTOT test results are coded with a Test Method code of "610" to indicate a test temperature of 260°C and with a code of "610X" to indicate a test temperature of 275°C. Each JFTOT result is composed of a measurement of pressure differential and of a rating of deposits formed on the JFTOT tube. The histograms presented in **Section III** required only two axes (the property being measured and the volume), thus the 2-dimensional histogram was sufficient. Since the JFTOT data is in the form of two-variable tube deposit rating – pressure differential pairs, a 3-Dimensional histogram is needed in order to represent the three axes needed to count the occurrences of each data pair.

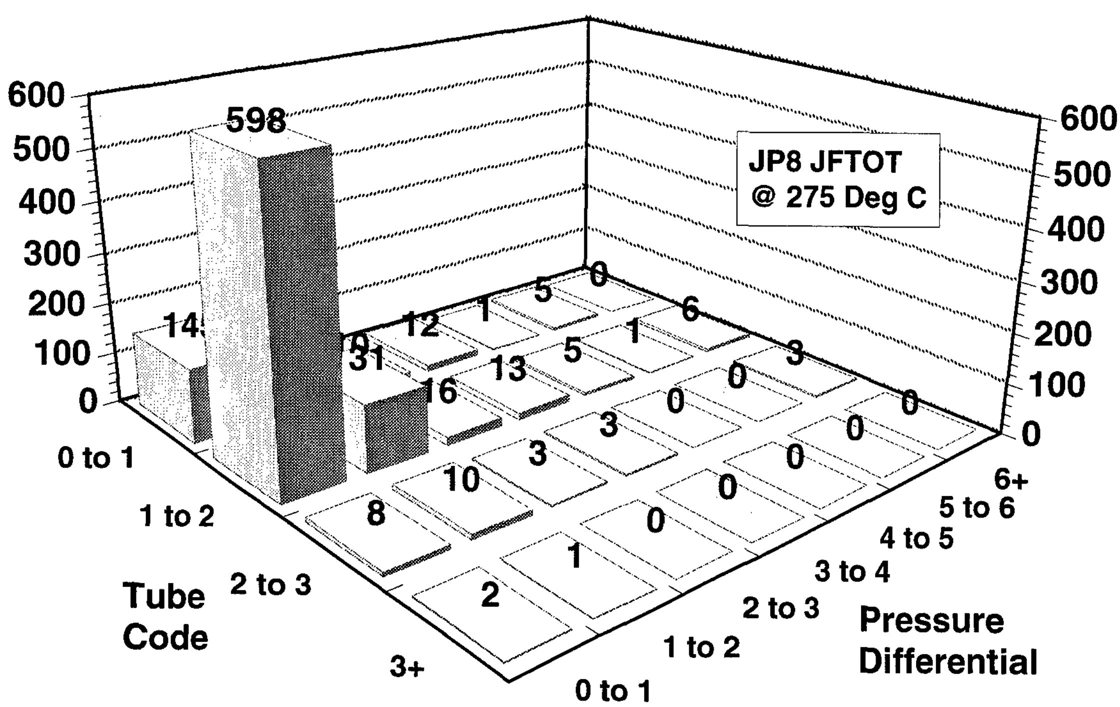
The JFTOT data pairs are specified along a "Tube Code" axis and a "Pressure Differential" axis. The numbers on tip of each bar represents the number of pairs which fell into the ranges specified on the axes. The ranges on the axes include the first number in the series up to but not including the second number. Therefore a "Tube Code" range of "1 to 2" represents a code rating of "1", a code range of "2 to 3" represents a code rating of "2" and so on.

Comparing the test temperature charts for the same product, the effect of raising the test temperature from 260°C to 275°C for JP5 shifts the "Tube Code" rating from mostly "0" to mostly "1". Most of the data for 260°C occurs at the pair of Tube Code = "0" and Pressure Differential = "0" with the data spread over a four-block range. In the 275°C Chart, most of the data occurs at Tube Code = "1" and Pressure Differential = "0" for both products. The data at 275°C is more compact than at 260°C. This effect is more pronounced with JP8 than for JP5.


JP5 JFTOT
@ 260 Deg C
30
25
20
15
10
5
0
24
10
14
5
0
0 to 1
1 to 2
2 to 3
3+
Tube
Code
0 to 1
1 to 2
2 to 3
3 to 4
4+
Pressure
Differential


JP5 JFTOT
@ 275 Deg C
160
140
120
100
80
60
40
20
0
158
5
16
1
1
0 to 1
1 to 2
2 to 3
3 to 4
4+
Tube
Code
0 to 1
1 to 2
2 to 3
3+
Pressure
Differential


JP8 JFTOT
@ 260 Deg C
Tube Code
Pressure Differential
0 to 1
1 to 2
2 to 3
3+
3 to 4
4 to 5
5+


JP8 JFTOT
@ 275 Deg C
Tube Code
Pressure Differential
0 to 1
1 to 2
2 to 3
3+
3 to 4
4 to 5
5 to 6
6+